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CHEMICAL & METALLURGICAL ENGINEERING

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Electrochemists Hold Successful Convention

THIS is the season of the year when the operator forsakes the plant and the chemist his laboratory to spend a few days of pleasure and profit at national gatherings of our great scientific societies. Consequently *Chem. & Met.* has devoted considerable space in the current issue, as well as in the one immediately preceding, to reports of the proceedings of two great national societies.

The Philadelphia meeting of the American Electrochemical Society was in every sense a notable success. Organized into two symposia and two luncheon round-table discussions, it attracted an unusually large number of operators and manufacturers and developed useful discussion. Following the policy that has now been in vogue for several years, the subjects of the symposia were known a year in advance and the papers were preprinted. This insured a degree of success that is obtainable in no other way.

Following the custom inaugurated a year ago at Dayton, round-table discussions were held following luncheon. The informality of these gatherings, supplemented by the assurance that confidences would be observed and stenographic notes would not be taken, led to the frankest exchange of views. The practice is to be continued in the meetings that have already been announced for Detroit and Niagara Falls.

The Profession of Ceramic Engineer

INCREASING recognition is to be noted of the importance of engineering and technical skill in the application of science to the ceramic industry. The time has come when rule-of-thumb practice must make way for methods of operation that are capable of scientific explanation and scientific control. The tremendous strides made in the efficient utilization of clays are reflected in a recent announcement by the Civil Service Commission that a ceramic engineer is needed for the U. S. Bureau of Mines experiment station at Columbus, Ohio, and that the salary will range from $3,800 to $5,000 per annum, according to the qualifications of the appointee. In any case he will receive a fair return for his labors, as government salaries go in the bureaus and investigation departments.

There is increasing evidence available as to the recognition of the importance of research in this comparatively virgin field, in which, however, significant advances have been made in recent years. The development of the tunnel kiln and the perfection of methods of humidity drying are having a significant effect on quality and cost of production. The problem of preparing the raw materials is being reduced to a science of understandable proportions, in which standard chemical engineering equipment plays an important rôle. Methods that depended on mysterious combinations and brought results only at the beck of the operator of many years experience are being replaced by standardized procedure, the result of a common-sense appreciation of fundamentals. The alleged superiority of foreign clays is giving way under a scrutiny of chemical compositions and physical characteristics, with the result that the research engineer will soon be able to proclaim independence from non-domestic supplies of raw material.

It is well within the range of probability that the United States will soon lead the world in quality as well as in quantity of clay products, but this can be brought about only by intensive investigation in new avenues of research. The work being done at Columbus and at other centers of ceramic engineering research is furnishing the fundamental data that will make our ceramic industries foremost in the world.

Nitrogen For Agriculture

IT IS well established that there has been an overproduction of foodstuffs, especially cereals, in the United States, and that this is basically the cause of the agricultural distress today. This overproduction, however, is but a passing phase of American agriculture. The real problem of tomorrow is the maintenance of soil fertility so that adequate agricultural production can be provided for an ever-increasing population. Obviously a supply of nitrogen in the form of reasonably priced fertilizer is essential to a solution of this problem.

Because of these important facts of general economic significance, more than usual attention should be given to the nitrogen survey of the Bureau of Foreign and Domestic Commerce, an excerpt of the second portion of which is presented in this issue. This document has been prepared with special attention to the problems of nitrogen supply for agriculture; but the chemical industries as well as the agricultural interests of the country must give close attention to the summary of fact and well-founded opinion here presented.

At this time it seems well to emphasize more strongly than can be done in the brief excerpts from the report the essential difference between cheap nitrogen and cheap fertilizer. Of the cost of fertilizer at the farm, which is the thing of real concern to agriculture, the cost of nitrogen is an important but by no means dominating part. To produce nitrogen at one-half its present cost in Chilean nitrate or ammonium sulphate does not by any means indicate a halving of the cost of the fertilizer. In fact it may mean only 5 or 10 per cent reduction. Simply obtaining ammonia from the direct synthetic process or nitrogen oxides from the arc process does not give a finished fertilizer constituent; nor does it take any account of the large percentage of fertilizer cost incurred for selling, transportation and

long-time credit to the farmer. We should by all means continue to strive for cheap fixed nitrogen, but at the same time heed the warning of this government report that much more than cheap fixed nitrogen is needed to insure a low price of fertilizer.

Moore and "More About Helium"

OFTEN it is dangerous to ask a man to talk about his hobby, for in accepting your invitation he is likely to lose all sense of time and proportion. But this is far from being the case with our good friend R. B. Moore, whose refreshing talks on helium have won for him a host of friends the country over. Only recently he told the members of the Petroleum Division of the A.C.S. something more about helium development—technical as well as political—that should be of interest to all who have followed the remarkable story of this all-American enterprise.

Lately significant progress has been made in developing processes for the repurification of the gas that would otherwise be wasted. At Lakehurst, N. J., a high-pressure, low-temperature apparatus has been perfected for this purpose. In its Cryogenic Laboratory the Bureau of Mines, co-operating with the War Department, has used activated carbon as the basis for a simple method that is said to yield striking results. The impure helium is passed through the usual type of charcoal adsorber. At low temperatures the carbon exhibits the remarkable property of adsorbing all of the 15 or 20 per cent of nitrogen and oxygen that contaminate the gas. The helium continues to pass from the adsorber in 100 per cent purity until the saturation point is reached for the carbon, which is then easily regenerated. This repurification plant has the further advantage of being easily transportable—in fact, it is mounted on a railroad car and can be conveniently shipped to any locality in which its services are desired.

Production in the government plant at Fort Worth, Tex., now proceeding at the rate of approximately a million cubic feet a month, may be expected to show considerable improvement, Dr. Moore averred. With new equipment recently installed, it is confidently expected that the cost of helium will be considerably reduced—perhaps by as much as 50 per cent, or from 6c. to 3c. per cubic foot.

But just as we are about to congratulate ourselves and the American chemists and chemical engineers responsible for these advances in technology, we are stopped short by the spread of insidious propaganda. On the authority of Captain Anton Heinen, the German engineer and the pilot of the "Shenandoah" on her recent runaway trip from her mooring at Lakehurst, the newspapers are giving publicity to considerable adverse criticism of helium. In spite of the fact that the great dirigible disasters of history have been due principally to fire and explosion, this famous pilot seems to hold the view that hydrogen because of its slightly greater lifting power is more satisfactory than helium and, of course, many times cheaper. And, too, this is in spite of the fact now fairly well established that had the "Shenandoah" been filled with hydrogen the heat and sparks resulting from the shearing of the metal parts as it tore away from the mooring mast would undoubtedly have ignited the contents of the bag.

Perhaps Captain Heinen's statement can be attributed to the foolhardy bravery that the public likes to associate with the daredevil airman. Perhaps it is only the desire to revive the fading spotlight of sensational publicity. But in any event it has the deepest national significance. The future of lighter-than-air craft in this country for commercial as well as military purposes depends largely on the continued successful performance of our one large airship. To risk so great a national asset on the false economy of cheaper hydrogen would indeed be criminal.

Greater Discrimination in A.C.S. Papers Desirable

THE sixty-seventh meeting of the American Chemical Society held in Washington, April 21 to 26, was a conspicuous success. More than nineteen hundred registrations point to an unusual vitality in the organization and a keen interest in scientific Washington on the part of the chemists of the country.

Seventeen divisions held meetings during the convention. One noticeable tendency of these divisional programs was the increasing number of symposia on special subjects of interest to the individual group. This is an effort to get away from the great number of irrelevant, unrelated papers that swamp many of the sections. So acute has this swamping process become that some prominent chemists have given up the presentation of papers at these meetings and many do not attend the divisional meetings in which they are most interested. The trouble lies in the ease with which a paper can be introduced into the program of the divisional meetings. Secretaries do not feel empowered to refuse a paper and there is no machinery by which the approval of four or five men is required before a paper may be presented.

How much better it would be to have only four papers presented at a morning session of a division—papers that represent a finished research, a contribution to knowledge. Such papers could be discussed at length, in detail and to the advantage and benefit of all. Now, however, a paper often represents a few months work and amounts to nothing more than an announcement that work is being done on the problem—a reservation of a field. Discussion is frequently impossible, since there is little to discuss. Many a paper is merely a bid for an increase in rank on the part of an instructor or an assistant professor.

The subject is live, for a large number of chemists have commented on it. Some have suggested the adoption of the effective policy of other scientific and technical societies—a policy of rigid inspection of papers so that it would be a signal honor to present a paper before a division of the American Chemical Society. It might be desirable for the divisional secretaries to follow the plan of the editors of the society's journals. All papers submitted to the journals are reviewed by four or five competent judges before they are approved for publication. Thus each division would have a committee to approve papers before presentation and the average divisional meeting would no longer be a training ground for young chemists but a vital, constructive part of industry or science. Should not the council of the society undertake the appointment of such committees and the education of secretaries to the view that a successful program consists not of sixty or seventy random papers but of a few well-chosen, timely papers that represent real contributions to the world's knowledge?

Problem Interrelation In the Chemical Industries

FREQUENT repetition of the truism that mental isolation spells inefficiency is needed to deflect the attention of those who are faced with difficult problems to the availability of data on subjects often considered of local moment and concern. In studying the various methods adopted for decolorizing sugar sirup by bone char we have sometimes been struck with a disregard of research in other phases of chemical engineering. It is therefore pertinent to emphasize that the problem of the even passage of a liquor through a mass of insoluble material is one that has received much attention by those who are concerned with the efficient leaching of crushed material containing a comparatively small amount of recoverable product. Leaching always involves percolation; the decolorizing of sirup by bone char may be termed negative leaching, because the circulating solution is deprived of a waste product, rather than enriched by something of value. But the mechanical problems involved are almost the same in each instance. The success of the operation depends on the provision and the maintenance of even percolation, whether recovery or purification is the aim.

If it were practicable to use bone char grains of the same size throughout, no difficulty would be experienced, whatever the method adopted to charge the filtering receptacle. But handling and reburning involve comminution; and, although screening is practiced before re-use of the material, it would be economically undesirable to discard all but the coarsest size. The efficiency of decolorizing would also be reduced because of the diminution in surface area exposed. The same is true of material that is leached by gravity for the recovery of soluble matter. Crude kalinite associated with gangue, nitrate rock or metalliferous ore is crushed to a degree permitting maximum net recovery. The product varies from the finest powder to a limit of coarseness set by the crusher or screen in use. The delivery of this material to the vat in which wet treatment is effected involves many more factors than are usually considered as affecting efficiency. Belt conveying into the vat, unless steps are taken to prevent the formation of banks and the rolling of the larger pieces to the bottom, is not always desirable. The ideal of uniformity is reached when the mixed product is distributed without segregation of coarse from fine, and without the local concentration of either in any part of the vat. It is not practicable to pulp the raw material with water or solution before filling, because under such conditions an immediate classification is likely to occur; and it is recognized that the equilibrium of the mass, in terms of particle distribution, when once disturbed, cannot be readjusted.

The same problems are found in decolorizing liquids by passage through a filter bed composed of particles of an adsorbent of varying sizes. When the dried medium used in the so-called char filters is delivered in a stream of less diameter than the diameter of the vat, there is a tendency for a cone to form, the coarser particles rolling down the sides and ultimately providing a passageway of lower resistance to flow, through which the liquor short circuits. As an alternative, the incoming char may be mixed with sufficient sirup to insure the coherence of the mass in its original mixed form, but in insufficient amount to permit free movement of the larger particles relative to the mass as a whole. This method involves close control, but advantages have been claimed by its adoption. A third modification promises a fairly satisfactory maintenance of the original composition of the dry char in the tank by the provision of a distributor, by which the stream of entering material is divided into numerous smaller streams, each of which supplies a definite area of a cross-section of the tank. This indicates a step in the right direction; although it is evident that, unless precautions are taken against segregation of coarse from fine in the act of falling from the distributor to the top of the bed, irregularities are inevitable; and, as the tanks may be as high as 25 ft., segregation will diminish in degree as the tank is filled, thus introducing an additional variable. The underlying problems are mechanical, however; and they do not present insurmountable difficulties. The point we would emphasize is that maximum efficiency in such an operation depends primarily on a recognition of certain fundamental principles, chief of which is the need for the distribution and maintenance in the filter of an evenly mixed material. That such a fundamental principle is not recognized generally was brought home recently when an experienced sugar operator recommended the use of a long-handled shovel with which he suggested that the char should be rearranged at the edges of the tank, after poor percolation had been observed. In other applications of the practice of passing a liquor through a finely divided solid of mixed particle size it has been proved conclusively that no rearrangement of this kind is possible without a sacrifice of efficiency. Such a problem as the one under consideration is not peculiar to the sugar industry; and one of the principal functions of *Chem. & Met.* is to act as a clearing house of information of this character, to link together the various unit processes that form the basis for chemical engineering practice and to encourage the reduction of waste by the avoidance of duplicated research.

Suits for Libel

CONSEQUENT upon the exposure in *Chem. & Met.* of the Detroit Aero Metals Co. and Glen Lenardo Williams, self-styled "Doctor," we are informed that libel suits have been brought by the company and Williams against the Detroit Board of Commerce, which reprinted *Chem. & Met.'s* article in its weekly magazine, *The Detroiter*. About the same time that the suits were filed the *Commercial and Financial World*, a publication of New York City, published in its issue for April 19 a laudatory article on the Detroit Aero Metals Co., telling of the substantial progress being made in the company's plant toward the production of the marvelous alloy that is lighter than aluminum and as strong as steel. The article bears all the earmarks of a gratuitous boost and is apparently inspired as a result of the desperate straits in which the company finds itself as a result of its exposure. Since our last reference to this company we have discovered that Williams and the Williams Chemical Corporation were exposed and branded as swindlers in the *New York Curb*, April 13, 1918

The President Addressing the Members of the American Chemical Society on the White House Lawn

The Chemist's Place in the Nation

President Coolidge Expresses the Appreciation of the Country to the Chemists for Their Vital Work Toward the Welfare and Progress of Humanity

IT SEEMS fitting that your government should acknowledge the debt that is due to the scientists and chemists who are devoting their lives to the search for truth.

Our material progress depends upon the acquisition of knowledge, and upon the wise and beneficial use of knowledge depend our permanent progress and prosperity. While it is everywhere recognized that the endeavors of scientific men have given to the world the foundation of modern industrial civilization, another contribution by them—the ideal of service—is perhaps of greater import to the nation and the future.

The American chemist has always rendered that service to the greatest degree. During the World War he forsook profit and gain to devote his entire energy toward the solution of the nation's problems of warfare.

Modern life has become extremely complex. We are enjoying comforts and advantages undreamed of a generation ago. These have become possible to a large measure through the knowledge and work of the chemical profession. Industry is learning to apply the knowledge of the chemist in its processes. Each step by which the products of the soil, the forest and the air are converted into commodities of everyday life requires the expert assistance of the chemist and the chemical engineer.

Whenever nature's bounty is in danger of exhaustion, the chemist has sought for a substitute. The conquest of disease has made great progress as a result of your efforts. Wherever we look, the work of the chemist has raised the level of our civilization and has increased the productive capacity of the nation. Waste materials, formerly cast aside, are now being utilized.

The American chemist has proved himself second to none in scientific knowledge under practical application. The World War brought vividly to our attention that our industrial chemistry had lagged behind that of Europe, but we are pleased to believe that this is no longer true. There are those who believe that Americans have not the patience to undertake the research work and develop new ideas in the chemical world, but the results emanating from American laboratories disprove this. The wide range of subjects upon your program indicates the great interest in research and development work going on everywhere in this country.

The people of the United States, I am sure, appreciate the remarkable progress which has been made in the past years and the part played therein by your profession. This meeting, which I am told is the largest in the history of your society, has my best wishes and those of the nation, that it may serve its useful purpose. To the men and women who represent your membership I wish to extend a cordial welcome and every good wish for continued success.

Yours is the profession of opportunity. Many problems are still unsolved. If the future can be gaged by the measure of progress in the past, your contributions to the health, wealth and happiness of the nation will be of surpassing value to the American people.

The Electrochemists at Philadelphia

Sessions on Furnace Refractories, Electrolytically Produced Organic Compounds, Hydro-electrometallurgy of Copper, Nickel, Tin and Iron—Howard C. Parmelee the New President of the Society

THE American Electrochemical Society gladly responded to the cordial invitation extended to it by the Philadelphia local section to hold its forty-fifth meeting there. It was a return to the birthplace, for here in the spring of 1902 Dr. Carl Hering, Dr. E. F. Roeber, Dr. Joseph W. Richards and a few others met and laid the cornerstone of the society that has become the most dominant factor in America in the promotion and advancement of the electrochemical and electrometallurgical art. The bound *Transactions* of the society form a remarkable record of achievement in the application of electricity to the production of an endless variety of important products and processes.

The outstanding features of the Philadelphia meeting, which broke all past records in attendance, were first of all the informal round-table discussion on "Refractories for Electric Furnaces" and the two symposia, the one on "Electro-Organic Chemistry" and the other on "Electrodeposition."

Organic Chemicals Electrolytically Produced

Owing to the steady development and increasing number of applications in Europe of electrolytic methods for the fabrication of aliphatic and aromatic compounds, the society had for some time been planning a symposium on the subject in order to bring together the scattered information available and to discuss the future possibilities of an electro-organic chemical industry in this country. A committee composed of Dr. C. J. Thatcher of New York, chairman; Alexander Lowy, University of Pittsburgh; E. R. Weidlein, director of the Mellon Institute, and Dr. H. C. P. Weber, of the Westinghouse Research Laboratory, made a careful survey of the field and arranged a highly illuminating program for the Thursday morning's session at Philadelphia.

In opening the symposium, Dr. Thatcher, inventor of the electrofiltros diaphragm and one of the few Americans who has been commercially successful in the production of organic chemicals by direct electrolysis, pointed out that benzidine is being manufactured electrolytically in Switzerland on a large scale; in Germany a number of plants are turning out anthraquinone using electrochemical methods; in the United States the application of electrochemical methods is more or less confined to the regeneration of spent chrome liquors resulting from the use of chromic acid mixtures in the oxidation of anthracene and anthraquinone, toluene to benzoic acid, and naphthalene to phthalic anhydride. In New England a concern is making 1,500 lb. of benzoic acid a week by bichromate oxidation and regenerating the acid electrolytically. Many tons of anthraquinone have been produced electrolytically by a New York concern and enlargement of its plant is at present contemplated.

The University of Pittsburgh contributed three of the nine papers presented at the symposium. Professor Lowy and Kendall S. Tesh reduced salicylic acid to the aldehyde, using a mercury cathode and a solution of boric acid and sodium sulphate as catholyte. A current density of 6 amp. per sq.dm. was employed and the aldehyde formed was fixed by means of sodium bisulphite. The best yield obtained to date is 55 per cent. Discussing these results, Dr. Francis C. Frary, of the Aluminum Co. of America, suggested that a larger body of amalgam might be better, also more vigorous agitation, but Dr. Lowy pointed out that stirring had always caused the amalgam to decompose too rapidly. Other metals besides mercury have been tried, but the yield was best with mercury.

Electrolytic Reduction of β-Anthraquinone Sulphonic Acid

This reaction was investigated by Professor Lowy and A. R. Ebberts. In sulphuric acid solutions an olive green "vat" (β-anthraquinol-sulphonic acid) was obtained. On further reduction this "vat" is converted to a yellow solution. Reduction of sodium β-anthraquinone sulphonate produced the typical red vat.

Electrolytic Preparation of Metanilic Acid

This investigation was carried out by Arthur K. Doolittle at the electrochemical laboratories of Columbia. It was found that the yield increased with both rise in temperature and in current density. The analytical determination of the yield presented considerable difficulties and a new method of analysis had to be devised. The calcium salt of meta-nitrobenzene-sulphonic acid was used as the starting material. The electrodes were lead.

The paper was discussed at length by Messrs. Thatcher, Lowy, C. Schall, Brockman and W. C. Moore. Dr. Moore, of the U. S. Industrial Alcohol Co., Baltimore, referred to the possibilities of increasing the yield in electrolytic organic reactions by substituting another solvent for water, such as HCN or absolute alcohol.

Electrolytic Oxidation of p-Nitrotoluene and p-Chlortoluene

R. F. Dunbrook and Alexander Lowy electrolytically oxidized p-nitrotoluene and p-chlortoluene in nitric acid solutions, using platinum electrodes. The corresponding acids were obtained. In the production of p-chlorbenzoic acid the best results were obtained at an electrolyte temperature of 100 deg. C., a current density of 0.5 amp. per sq.dm. and 20 per cent nitric acid solution, using glacial acetic acid as a solvent.

Charles J. Brockman emphasized the importance in properly preparing or cleaning the platinum electrodes before use in an electrolytic cell such as Dunbrook and Lowy had employed. Dr. Thatcher mentioned that the product at a Pt electrode is often entirely dependent

upon the past history of the metal. Dr. Frary strongly recommended the use of the gas coulometer for measuring efficiencies.

Electrochemical Oxidation of Aromatic Hydrocarbons

Professor Fichter of the University of Basel, Switzerland, presented two very valuable contributions to the symposium. In the first paper he offered a detailed review of the field of electrochemical oxidation of aromatic hydrocarbons, and suggested numerous possible lines along which further research appears most promising. Anodic oxygen is probably the most energetic of all oxidizing agents, and if properly employed will lead to many new important results.

Dr. Arthur W. Burwell of Chagrin Falls, Ohio, a specialist in organic electrochemistry, cited instances where *p*-amidophenol was being produced in 100-lb. lots abroad. In the case of phthalic anhydride, it has become customary to regenerate the chromic acid in a separate cell; this is cheaper as far as labor goes than using but a single cell for the two operations, oxidation of the organic compound and regenerating the acid. Dr. G. Arnstein of the Chemical Industries, Inc., of Los Angeles, Calif., announced that his company was making 60 to 70 per cent acetic acid by the electrolytic oxidation of alcohol. A second plant is located in Colombia, South America.

Electrolytic Production of Cobalt and Nickel Triacetates

Prof. C. Schall and his co-worker, H. Markgraf, of the University of Leipsic, reported the results of their findings in their investigation on the oxidation of the diacetates of Co and Ni to the corresponding triacetates. Pure cobalt and nickel diacetates were dissolved in absolute acetic acid. The solution was electrolyzed between platinum electrodes, and pure nickel and cobalt triacetates were obtained, which crystallized into well-defined green octahedrons. These electrolytic oxidation results support the freezing point lowering determinations and direct chemical analysis, and indicate that the two triacetates have the simple formula $Ni(CH_3COO)_3$ and $Co(CH_3COO)_3$, respectively. Failure in obtaining these triacetates in the past was found to be due to the presence of small amounts of water in the acetic acid solutions.

The paper was discussed by Messrs. Lowy, Moore, Fink and Weber. Dr. Fink referred to the catalytic effect of mere traces of Pt that tend to go into solution when using Pt electrodes and mentioned that this must be taken into account in interpreting electrolytic oxidations or reductions, in particular, in strong acid solutions such as HCl. Dr. Moore recommended the use of a silver-plated platinum electrode for chloride solutions, which he found would materially reduce the formation of Pt chlorides.

Function of Peroxides and Peracids in Electrochemical Oxidation of Organic Compounds

In the second paper of Professor Fichter he discussed at length Kolbe's synthesis as applied to various reactions. In many cases platinum anodes at high current densities are essential to bring about the reaction. The oxidation potential of elemental fluorine is equal to or even greater than that of nascent oxygen. The peroxide-formation hypothesis has many advantages over other hypotheses. In discussing Professor Fichter's paper, Dr. Burwell mentioned that the company with which he has been connected is oxidizing fatty acids electrolytically and in ton lots. Dr. Weber, of the Westinghouse company, suggested that since anodic oxygen is decidedly the most powerful oxidizing agent, it would seem to indicate that, in many oxidization reactions which are only brought about anodically, we are dealing with an electrochemical and not a simple chemical reaction. Dr. Moore doubted whether it was really possible always to differentiate between the two types of reaction, electrochemical vs. chemical, reciting his experience with permanganic acid solutions. Dr. Thatcher in reply outlined the method he had developed at the Ostwald laboratories, Leipsic, years ago based on the use of poisons, such as cyanide, added to the solutions. If, for example, chemical oxidation took place at a Pt black surface, the addition of a trace of HCN would inhibit the reaction. On the other hand, electrolytic oxidation was little or not at all affected by such a trace of HCN. Dr. Frary added that in the case of electrolytic oxidation, we must not forget to take into account the high concentration of oxygen right at the point where the reaction takes place.

Electrolytic Reduction of Acid-Oximes

The last paper in the organic symposium was offered by Prof. Masayoshi Ishibashi, of the Kyoto Imperial University. The electrolytic reduction of γ-isonitrosovaleric acid and α-isonitroso-propionic acid in a sulphuric acid solution was studied and the most favorable conditions for reduction and best yield of amines were determined. The γ-nitroso acid is more apt to undergo hydrolysis even in a more dilute sulphuric acid solution, with a smaller current density and at a lower temperature, as compared with the α-nitroso acid.

Refractories for Electric Furnaces

One of the best round-table discussions ever held by the society took place Thursday noon, April 24, in the roof garden of the Bellevue Stratford Hotel. "Refractories" is a topic that is at present absorbing the attention of a large group of engineers and manufacturers, and consequently the attendance at this informal discussion was unusually large. There were nearly 150 covers taken and many of the members and guests participated actively in the discussion. Dr. M. L. Hartmann, director of the Research Laboratory of the Carborundum Co., presided and largely to his untiring efforts and able chairmanship is the success of the "Table" to be attributed. Alfred Stansfield, of McGill University, was the guest of honor. He opened the discussion by outlining briefly the various types of electric furnaces, construction of the hearths and roofs, and the different methods, or "dodges" as he termed them, resorted to in combating the low melting point of our present best commercial refractories. Since the maximum permissible temperature under load for silica roofs is about 1,625 deg. C. and since the arc temperature may be 3,000 deg. C. or more, a clever practical "dodge" is to use a comparatively thin roof and either air-cool or water-cool this. In some cases the heat-insulating qualities of fine dust became very apparent and the furnace operator was instructed to keep the roof dust free. Water-cooled magnesite linings that were scoffed at only a few years ago are now regular practice in a number of foundries. Neutral linings,

such as those composed of silimanite, are preferred in a number of instances in spite of the lower melting point as compared with silica and magnesite. The high electrical conductivity of silimanite at elevated temperatures is a more serious objectionable factor than the lower melting point.

Dr. Otto Frick, inventor of the Frick induction furnace, gave an account of developments in Germany and believed that it would not be long before 100-ton electric steel furnaces were in use. The application of magnesite brick for roofs is also a possibility. It is important to design the bricks properly. Full face contact between bricks is not as good as contact and pressure at the middle of the brick.

In the general open discussion that followed both manufacturers and engineers participated. Much emphasis was laid on the proper storage and care of refractory materials, in particular material shaped into bricks. Spalling of silica brick is often due to out-of-round roof rings. Small strips of wood placed between the bricks often help to reduce spalling. Pure fused magnesite will withstand temperatures decidedly higher than will ordinary magnesite and it is not as readily attacked by the slag. The larger the crystal of the fused MgO the less likely will it be attacked by the slag. Silica is a very objectionable impurity in magnesite. On the other hand, dolomite bottoms have been used in electric steel furnaces and give satisfactory results. In the reduction of vanadium, carbon linings have been giving good service. A fifty-fifty mixture of chromite and magnesite has given good service in zinc furnaces.

A symposium on electroplating presided over by Dr. S. Skowronski was a most successful feature of the meeting. Dr. William Blum, of the Bureau of Standards, was the first speaker. Abstracts of this important series of papers will be published in the next issue of *Chem. & Met.*

Electrolytic Refining of Metals

This session was presided over by Mr. Skowronski and formed the sequel to Friday's symposium on electroplating. In his opening address the chairman reviewed the progress made in the electrolytic processes for copper, zinc, lead, tin, nickel, gold and silver. He also commented upon the industrial changes that have taken place within recent years. Chile and the Congo are rapidly becoming very important copper producers and are supplying a large fraction of the metal for the world's consumption. Tin has left for England. There is no tin industry in this country at present. Electrolytic nickel has left for Canada. A large electrolytic silver plant has been established at Pachuca, Mexico.

Electrolytic Copper in Katanga

H. Y. Eagle, of the Union Minière du Haut Katanga, submitted a brief account of the new electrolytic tank house erected at the Panda works in the Belgian Congo. Of special interest are the electrolytic tanks, which are the largest of the kind ever built. The electrolyte enters the tanks at the rate of 20 liters per minute and with 35 grams of copper per liter. It leaves the tanks with 15 grams of copper per liter and thence passes over fresh quantities of malachite ore. The temperature of the electrolyte is comparatively low, 37 deg. C., and accordingly the effect of iron in solution is less harmful than at higher temperatures ordinarily employed. Lead anodes, insoluble in the sulphate electrolyte, are used and the energy efficiency averages 0.508 kg. per kw.-hr.

Messrs. Thompson and Stansfield questioned the statement made by Mr. Eagle that the "composition of the electrolyte remains uniform throughout the 50-ft. tank." Others who participated in the discussion of the paper were Messrs. Ferguson, Hine, Jorgensen, Fink and Skowronski.

Tank House of the Chile Exploration Co., at Chuquicamata

In this account of the large electrolytic tank house in northern Chile C. W. Eichrodt describes the various steps of the process in the winning of the copper from the ore.

The natural copper sulphate mineral is leached with spent electrolyte. The strong solution, high in copper and low in sulphuric acid, is treated with finely divided copper to remove the chloride ions as cuprous chloride. After dilution of this strong solution with solution partly electrolyzed, it passes into the electrolytic tanks. These tanks are constructed of concrete, and are lined with acid-proof mastic. At the rate of 800 liters per minute the solution passes through a sixteen-tank section in less than 3 hours. With the introduction of the new copper silicide (Chilex) anode, the acid plant and cooling tower have been dispensed with, and the iron content of the electrolyte has been reduced from 20 grams down to about 3 grams per liter. The marketable cathode copper is of an average purity of 99.96 per cent Cu. The conductivity of the annealed metal is 100.9 per cent of the Mathiessen standard. Details of tank house operation were given, including complete analyses of electrolyte, starting sheet manufacture, mechanical handling of the copper, proper spacing of electrodes and electrical equipment.

E. L. Jorgensen, for many years connected with the Chuquicamata plant, described his experience with the copper silicide anode and complimented Dr. Fink and his staff on the remarkable achievements in finding and developing the anode. He pointed out that when the change from ferrosilicon to copper silicide anode was made, there was not only a drop in solubility but also a drop in voltage. Charles H. Eldridge referred to the various anodes that had been tried out at the plant, magnetite, ferrosilicon and copper silicide, and how this last anode turned out to be much superior to its predecessors. He referred to his own metallographic and corrosion tests of 3,000 test anodes during the 4 years at the New York laboratories. It was Mr. Eldridge who had christened the new anode "Chilex."

Electrolytic Tin

Three papers were presented on electrolytic tin. The first, by Prof. E. F. Kern and Edward A. Capillion, dealt with "Addition Agents in Tin Refining Electrolytes."

The effect of various addition agents on the cathode deposit of tin was investigated. The major portion of the tests was confined to acid tin sulphate and acid tin-sodium sulphate electrolytes. Chloride electrolytes were tried, but results were unsatisfactory. The addition of 5 grams HCl (or 9 grams NaCl) per liter of

electrolyte improved the quality of the cathode deposit, and furthered the uniform corrosion of the anode. Of the addition agents tried, glue was found to give the best results. Even when other addition agents were employed, the presence of glue seemed to be essential to insure uniform smooth, bright, adherent cathode deposits of tin. Glue to the extent of about 1 gram per liter gave the best results. The quantity of any addition agent added must be kept within well-defined limits; an excess causes non-adherent amorphous-like deposits of tin; if too small a quantity of an addition agent is present the deposits are coarsely crystalline. Cathode deposits from sulphate electrolytes kept at 47 deg. C. were not as adherent nor otherwise as satisfactory as cathode deposits from the same electrolytes kept at 23 deg. C.

Prof. F. C. Mathers, of the University of Indiana, did not agree with the authors as to a limiting quantity of addition agent and maintained that there is no limit. The theory of the addition agent's action was discussed back and forth by Dr. Froelich, Dr. Moore and others. Mr. Hogaboom cited the effect of the addition of CS_2 to silver cyanide solutions and that it was difficult to fit it in with the other effects observed. Dr. Hering and Dr. Moore described experiments with ampholytes. There seems to be a static effect and an electrolytic effect which controlled the movements of the colloid particles. Dr. Kern referred to his experiments many years ago on cresol sulphonate.

A historical development of "Electrolytic Tin" was presented by Charles L. Mantell, of Columbia University. He pointed out the deficiencies of the types of baths which have been tried and discarded and showed how the combination sulphuric acid-alkali sulphate tin sulphate bath combines the treeing of the acid bath with the sponge deposit of the alkaline bath, by neutralization of one effect by the other, producing a satisfactory medium for commercial electrolytic tin refining.

The third of the tin papers was by J. R. Stack, formerly superintendent of tin operations at Perth Amboy, N. J. Electrolytic refining of tin has been carried out on a large commercial scale at Perth Amboy since 1916. To date, the only practical solution of the problem of separating impurities such as antimony, arsenic, lead and bismuth from tin lies in electrolysis. The various electrolytes tried out commercially were discussed. The treatment of the anode slimes was briefly described. Glue-cresylic acid as an addition agent gave good results. Small percentages of hydrochloric acid or halogen salt overcome anodic polarization and assist anode corrosion. The electrolytic process is the most economical solution of the problem of producing pure tin from the impure Bolivian concentrates or crude metal.

The paper was discussed by Messrs. Mathers, Linville and Fink. Dr. Fink gave a brief historical sketch of the gradual change in the electrolyte during the 7 years of operation.

Progress of Electrolytic Iron

This subject was very thoroughly covered by Donald Belcher, of the Milford Electrolytic Iron Co., Milford, Conn. The Milford plant has been described in *Chem. & Met.*, vol. 27, p. 684, and vol. 26, p. 128. Mr. Belcher's paper was discussed by Messrs. Skowronski, Hine and Fink. It was the consensus of opinion that although electrolytic iron directly from the ore was at present laboring under difficulties, the Grenoble and the Hawthorne plants had demonstrated that electrolytic iron is a commercial product.

Fused Electrolytes

William G. Harvey, of Niagara Falls, opened this phase of the subject and referred briefly to the changes that have taken place in the electrolytic production of magnesium. The American Magnesium Corporation is using a fluoride bath in place of the classical chloride bath. The solubility of MgO in the fluoride bath is comparatively low, about 0.1 per cent. However, an excess of MgO is kept in suspension, otherwise the voltage rapidly rises. President Hinckley commented on the importance of the subject of "fused electrolytes" and announced to the members that the board of directors of the society had voted to hold a symposium on this topic at the spring, 1925, meeting at Niagara Falls.

Beryllium

Prof. B. S. Hopkins and his co-workers, A. W. Meyer and E. A. Engle, of the University of Illinois, produced beryllium metal of 98 per cent purity, using the fused sodium beryllium fluoride bath. They also obtained a number of highly interesting alloys with silver, aluminum, tin, calcium and nickel. H. S. Cooper, of the Kemet Laboratories Co., commenting on the results, felt that there was little promise of commercial success in the fluoride method for the production of the pure metal. On the other hand, the Illinois method for producing beryllium alloys directly offered great possibilities.

Tungsten

C. A. Mann and H. O. Halvorsen, of the University of Minnesota, after a number of vain attempts in other directions succeeded in getting gray tungsten metal deposits, using a fused mixture of KCL and LiCl as a bath. The paper was very ably discussed by M. M. Sobel, of Columbia University.

Howard C. Parmelee the New President

At the annual business meeting Friday morning the election of the following new officers of the society was announced: President, Howard C. Parmelee; vice-presidents, F. G. Cottrell, C. F. Burgess and Carl Hering; managers, S. C. Lind, A. H. Hooker and Duncan MacRae; treasurer, F. A. Lidbury; secretary Colin G. Fink.

The reports of various committees were presented. The treasurer's report showed that the society was enjoying a healthy financial era. The meeting place for the fall meeting was announced as Detroit, with E. L. Crosby as chairman of the local committee. The 1925 spring meeting will be held in Niagara Falls. At the conclusion of the business meeting President Hinckley delivered his address on "The Service Rendered by Technical Societies."

Social Features

The main social event of the Philadelphia meeting took place Friday afternoon. The local committee arranged for a boat ride on the Delaware followed by a planked shad dinner. The popular address of the evening was given by John Mills.

American Agriculture and Nitrogen Fixation

Some Reasons for the Nitrogen Survey and an Estimate of the Fixed Nitrogen Balance Sheet in America

By Harry A. Curtis

Special Agent, Bureau of Foreign and Domestic Commerce, and Professor of Chemical Engineering, Yale University

> **Back in the early days of this country land was plentiful and its fertilizer marvellous, especially in comparison with that of the Old World. As the country expanded and gradually utilized all the virgin soil of the Middle and Far West, the situation was little changed. Only within recent years has it become evident that time is approaching when the soil will have to be enriched artifically. Fertilizer cheap enough to be used universally will become a necessity within two generations. So much a balance sheet shows, and as cheap fertilizer is a problem for chemists and chemical engineers, there is forecast a field of tremendous importance and activity for them.**

THERE are three weighty objections to foreign monopolistic control of any raw material essential to American industries: first, that the production of the material may be limited arbitrarily, so as seriously to cripple dependent industries; second, the price fixed by the monopoly may be out of economic proportion to the cost of reasonably profitable production, so that an unnecessary burden is thrown on the American consumer; and third, if the material be such a one as is indispensable in time of war, the foreign source may not be accessible in time of most urgent need.

One such material is Chilean nitrate, which for a long time supplied nearly all of the world's requirement of inorganic nitrogen. With the only large workable deposit of natural nitrate located in Chile, and with a world-wide market available, it was of course to be expected that full advantage would be taken of the situation. At first Chile did not have the necessary capital to exploit the deposits, but a wise policy toward foreign investments in the industry soon resulted in a rapid expansion. The export tax placed on nitrate has been for 40 years the main source of Chile's revenue, and investments in the industry have been highly profitable. Chilean nitrate has in this period become a commodity of world commerce and has found wide use in the arts and industries. With the evolution of modern military explosives, Chilean nitrate became an essential item in war, but not more than a few per cent of Chile's export of nitrate has gone into this use; agriculture has always consumed the bulk of the output, and, next to this, the numerous industrial operations and manufacturing processes that use nitrate in one way or another.

The development of the byproduct recovery processes for distilling coal has, in more recent years, made available another large source of inorganic nitrogen supply, but this byproduct nitrogen is produced only to the extent that the coke and coal gas industries are able to market their main products, and, being a byproduct, it sells at a market level fixed by Chilean nitrate. It is only as agricultural fertilizer that byproduct nitrogen has replaced any of the Chilean nitrate in the United States, and even here the expansion of the fertilizer market has been so rapid that the actual quantity of nitrate used has increased.

It is quite possible to transform fixed nitrogen in any one form into fixed nitrogen in other form, so that the fixed nitrogen available as ammonia from the coke and coal gas industries can actually and easily be converted into artificial Chilean nitrate or into any other inorganic nitrogen compound. However, this involves elaboration costs, which must be taken into account. Similarly it is possible, chemically speaking, to convert the nitrate nitrogen of the Chilean material into ammonia or any ammonia nitrogen compound, but the cost of such conversion would be high, much higher than that for the reverse process. We find, therefore, that ammonia nitrogen from coal has no competition from Chilean nitrate in supplying the nitrogen requirements of cold storage establishments. On the other hand, all the nitric acid produced in the United States is made from Chilean nitrate, and will continue to be so made until ammonia can be produced so cheaply that the conversion cost can be absorbed. In agricultural fertilizer, however, the nitrate nitrogen and the ammonia nitrogen meet on a more even footing, for the conversion of the latter into the former is done by soil bacteria without cost. Aside from agricultural use, however, the various inorganic nitrogen compounds are not to be valued strictly on the basis of their nitrogen contents, for there enters into the situation the natural advantages that one type of nitrogen compound may have over others for the particular case in hand. Broadly speaking, however, any inorganic nitrogen compound can be made from any other and the conversion costs are pretty well known.

The new air-nitrogen industry that is now getting under way in the United States will no doubt in time yield nitrogen compounds in amounts sufficient to influence the markets. Competition from this quarter is likely to prove much more disturbing to Chilean nitrate than has byproduct ammonia heretofore. For when perfection of the air-nitrogen processes has reached a point where fixed nitrogen from this source can be produced much cheaper than the present price of nitro-

gen in Chilean nitrate, every nation will have within its own territory an inexhaustible mine of nitrogen, which, if only from considerations of national security, it will be impelled to develop, while Chilean nitrate, regardless of any improvements in methods of its production or other economies, will always be handicapped by being remote from centers of consumption.

It will be evident from what has been said above that while the natural monopoly that Chile enjoys over the source of nitrate, and the price control exercised by the association of producers in Chile, are matters that bring the Nitrogen Survey within the scope of the general investigation of raw materials now being conducted by the Commerce Department, these are but phases of a much larger problem. And as a part of the larger problem, the important question in connection with Chilean nitrate is not so much the fairness or iniquity of its political or financial control, but what variations in costs of production and delivery might be possible if Chilean nitrate were brought into severe

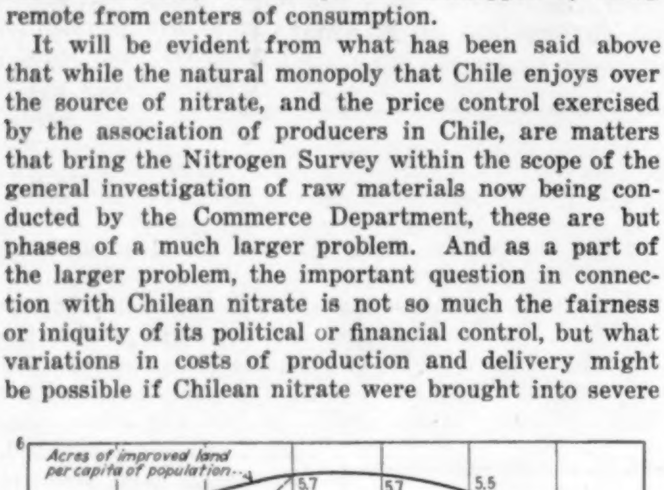


Fig. 1—Relation of Population to Cultivated Land and to Food Supply's Use

The food consumption per capita, affecting standard of living, necessarily depends upon the productivity of the soil, which is determined largely by extent of fertilization.

competition with synthetic nitrogen compounds. This question led to a field study, the results of which have been presented in Part I of the Nitrogen Survey Report (See *Chem. & Met.*, Jan. 7, 1924; p. 5.)

The present report attempts to relate the items of Chilean nitrate cost and supply with the remainder of the items involved and so present, in outline at least, a complete picture of the nitrogen situation as it exists in the United States today. In doing this it has been necessary to discuss a considerable number of topics, but no attempt has been made to follow the complex nitrogen problem in all its ramifications; rather there has been a conscious effort to terminate each discussion as soon as the main purpose of the report has been served.

Emphasis has purposely been thrown on the agricultural phase of the nitrogen problem, because here the problem reaches its widest human interest. What is done with the nitrogen problem in the next 10 years will probably determine to a considerable degree whether present American standards of living can be maintained. There seems no escape from the conclusion that unless relatively cheaper fixed nitrogen can be supplied to agriculture, steady decrease in crop production per acre will continue while our population is increasing rapidly. Agricultural production in the past has kept pace with the growth of population not by increasing the yield per acre but by continually increasing the acreage of cultivation, expanding into the richer soil areas of the Middle West and abandoning the poor areas of the East. The end of such a program is approaching not only because nearly all of the easily available areas are under cultivation but also because high labor and material costs and the accompanying high freight rates are already powerful factors acting to reduce the acreage of cultivation. Intensive crop production must ultimately be secured, and one very vital problem in such a program is the securing of cheap nitrogen. We are quite aware of the general feeling among agricultural producers that they as yet are far below the upper limit of productive capacity and need only a market yielding a reasonable return on cost of production, but disregarding temporary situations and looking ahead a few decades, it does not appear that American agriculture will lack a market for the utmost it can produce.

It has been deemed best to omit from this survey any consideration of the nitrogen carried by foodstuffs, although a complete nitrogen survey would necessarily include this nitrogen, and in some countries the import or export of nitrogen in this form might constitute the most important point to be considered. The great shipments of beef, dried blood, etc., from Argentina, for example, must represent one of the largest items in the nitrogen balance of that country. Similarly, such a country as Denmark is buying much nitrogen in the form of cattle foods, and a part of this nitrogen eventually finds its way to the soil of the country. For the United States, however, the imports and exports of foodstuffs are nearly balanced, in value at least. We are probably exporting somewhat more nitrogen in the form of foodstuffs than we are importing in this form, but a consideration of this phase of the problem would extend the present survey beyond reasonable limits and we shall not take further account of the fixed nitrogen which moves in or out of the country in foodstuffs.

A Balance Sheet for Nitrogen

Any attempt to arrive at a balance sheet for the nitrogen of the soil necessarily involves several approximations, and can at best be suggestive only. Such an estimate does, however, give some idea of how much nitrogen must be returned to the soil by use of commercial fertilizer even to maintain existing soil fertility. The accompanying table is taken from data proposed by Dr. J. G. Lipman, director of the New Jersey Experiment Station.

The net annual loss is equivalent to about 17,750,000 tons of ammonium sulphate or 22,750,000 tons of Chilean nitrate, or about 1,508,750,000 tons of ordinary 2-8-2 fertilizer.

Balance Sheet for Nitrogen in the Soil
(In Net Tons of 2,000 Lb. Each)

Annual loss, 60 lb. per acre, 300,000,000 acres		9,000,000
Gain:		
From manure of domestic animals	1,750,000	
Supplied by legumes	1,750,000	
Atmospheric precipitation	750,000	
Non-symbiotic bacteria	1,000,000	
	5,250,000	
Added in fertilizers	200,000	
Net annual loss	3,550,000	
		9,000,000

Data from *Journal of American Society of Agronomy*, vol. 2, No. 9, December, 1919, by Dr. J. G. Lipman, director New Jersey Experiment Station.

It is quite evident that even allowing for a wide margin of error in these estimates, the amount of nitrogen lost to the soil of the United States annually is enormous and that the soil is steadily decreasing in fertility, and this at a time when we are looking to an increased production per acre to meet the ever-increasing food demand of the nation. In view of these facts it is of utmost importance to conserve the nitrogen supply of the soil by every possible means, including the use of legume crops where possible, the elimination of waste in the handling of crop residues and animal manures, and by resorting to cover crops to prevent leaching of the soil, etc. And as a supplement to this program, the inevitable deficit must be met by intelligent use of commercial fertilizer. To supply the equivalent of 22,750,000 tons of Chilean nitrate is not altogether a hopeless task; we mine and transport more than 600,000,000 tons of coal annually and manufacture more than 20,000,000 tons of cement.

The Fertilizer Industry

Commercial fertilizers are materials carrying nitrogen or phosphorus, or potassium in forms available as plant food. Mixed fertilizers are mixtures of one or more of such materials, and the chemical analysis of the mixture is usually expressed in terms proportional to the percentage of each plant food present; thus the common 2-8-2 mixed fertilizer contains the equivalents of 2 per cent ammonia (NH_3), 8 per cent of phosphoric anhydride (P_2O_5) and 2 per cent of potassium oxide (K_2O).

The phosphorus for fertilizer is obtained from the phosphate rock of Florida and Tennessee. In order to render the phosphorus available as a plant food, the rock must be treated with about its own weight of strong sulphuric acid. The rock originally contains the equivalent of about 32 per cent of phosphoric anhydride (P_2O_5); adding the sulphuric acid, which reacts with the phosphate rock to form a solid mass, gives a material containing the equivalent of 16 per cent phosphoric anhydride (P_2O_5), and it is this material, suitably prepared for use, which comes on the market as acid phosphate fertilizer. This constitutes by far the greatest tonnage of any single material handled by the fertilizer industry, and this fact must be recognized in considering any program for obtaining cheaper mixed fertilizer.

The potassium compounds for mixed fertilizer are obtained almost entirely from the German and Alsatian potash mines, production in the United States amounting to only a small percentage of the consumption.

The nitrogenous materials for mixed fertilizer are assembled from a variety of sources. The meat-packing industry at one time organized fertilizer companies as a means of disposing of nitrogenous waste materials (tankage, blood, etc.). The bulk of these materials now find use as stock feed, only such as is unfit for this use being worked up as fertilizer. Cottonseed meal is also used as a source of nitrogen, and the fertilizer interests own many of the cotton oil plants. Here again, however, cottonseed meal is finding a better market as stock feed, and the tendency is to throw into fertilizer only a poor-grade meal. The same is true of the fish scrap, which formerly went into mixed fertilizer but now finds another market as hog and poultry feed, only such parts going into fertilizer as cannot be placed in the higher price market, or such as must be acidulated at the factories. All these materials, tankage, cottonseed meal and fish scrap, are, when properly manufactured, high-grade stock feeds, while at best they are but low-grade fertilizer, their chief value lying in the fact that they serve to "condition" a mixed fertilizer—that is, keep it dry and of the right consistency to use at the farm. Aside from these so-called "organic ammoniates," the fertilizer industry serves as a scavenger for a wide variety of similar animal and vegetable nitrogenous waste materials. There is a growing tendency to replace these low-grade nitrogen carriers with so-called "inorganic nitrogen," particularly in the form of ammonium sulphate and Chilean nitrate.

It is important to point out that with the exception of the Chilean nitrate and the small amount of synthetic nitrogen compound (cyanamide), all the nitrogen

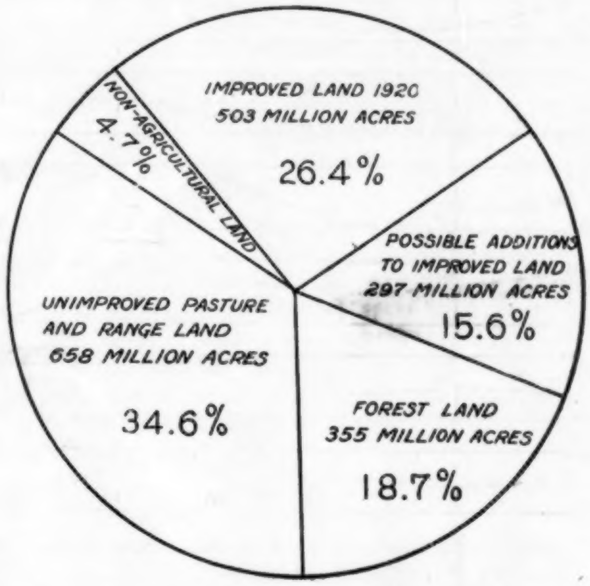


Fig. 2—Divisions of Land Area of the United States

in fertilizers is of byproduct origin. This fact automatically limits the production of these byproduct nitrogen compounds to the ability of the respective industries to dispose of their main products. Further, since the profits derived from byproducts serve primarily to enable any industry better to meet competition on its main product, it is evident that nitrogenous byproducts will be sold at the best market prices fixed by those nitrogen compounds which are derived as the primary products of an industry. It is for this reason that Chilean nitrate fixes the general price level in the United States for nitrogen compounds in the fertilizer industry, and will continue to do so until an air-nitrogen industry is developed that will seek to market its main product in direct competition with Chilean nitrate.

Much prominence has been given the fact that mixed fertilizers, taken as a whole, contain but little plant food and a great deal of inert material. The cost of handling this inert material, and particularly the freight charges that accumulate against it, are, of course, reflected in the final high cost of the plant food bought by the farmer. Blame for this state of affairs is often laid at the door of the fertilizer industry. While it is true that in order to meet specific formulas the mixed fertilizer manufacturer must in some cases add a certain amount of inert "filler," this amount is

small compared with the inert material that results from starting out with such low-grade fertilizer materials as are now available. There is no remedy so long as mixed fertilizers are made up by compounding materials containing at the outset only a few per cent of plant food. This is another argument for using less of the "organic ammoniates," which are all very low in nitrogen. Indeed, since the producers of animal tankage and cottonseed meal are less interested in disposing of these products as fertilizer, the fertilizer industry is itself carrying on an intensive campaign for use of so-called "high-analysis" fertilizers. Commendable as this effort is, it must be recognized that what is now called "high-analysis" fertilizer still contains less than 16 per cent of the three elements of plant food and that the excessive freight item now included in the cost

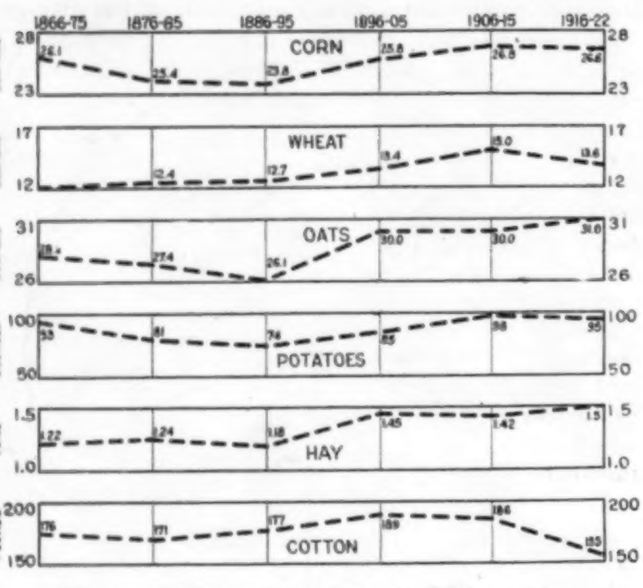


Fig. 3—Average Crop Yields in the United States

Note influence of increased fertilization and improved cultural methods after 1895 and drop in cotton yields caused by boll weevil after 1915

of fertilizer at the farm can never be cut out by such feeble reforms. The problem will be solved only when there is available for mixing in fertilizer raw materials rich in plant food at prices that will permit their use. This applies to both nitrogen- and phosphorus-bearing materials.

It has been pointed out that the manufacture and sale of acid phosphate constituted the main activity of the fertilizer industry, and that any program for getting cheap mixed fertilizer must take into account both the nitrogen and the phosphorus phase of the situation. The reason for the preponderance of acid phosphate in the fertilizer business today is the very simple one that it pays the farmer to use acid phosphate wherever it is the limiting factor in any crop production, while the use of nitrogenous fertilizer is not always justified at present prices of nitrogenous fertilizer. As an illustration of the situation, let us consider the value of phosphorus and the nitrogen removed from the land by a heavy crop of corn, say 100 bushels per acre. The phosphorus in the grain and fodder of 100 bushels of corn is about 23 lb.; the nitrogen is 148 lb. At a price of $16 per ton of acid phosphate delivered at the farm, it would cost only $2.62 to replace the phosphorus; the nitrogen, however, would cost $28.42 if replaced with Chilean nitrate at $60 per ton.

Another illustration will make clear the situation with reference to nitrogen. Let us assume that a very moderate application of nitrogen will increase crop production 10 per cent. Apply this to a cotton crop of 750 lb. per acre and the increase, at 20c. per pound of cotton, is worth $15; applied to a wheat field yielding 20 bushels per acre, the increased yield, at $1 per bushel, is worth $2.

If nitrogen could be obtained cheaply enough, there appears no reason to doubt that the crop production per acre could be greatly increased without a large increase in labor cost. Under present practices of fertilizer application, it is probable that more phosphorus is being returned to the soil than is being removed. It is certain, on the other hand, that the soils of the United States are steadily growing leaner in nitrogen content.

Considered broadly, there are three developments necessary before cheap fertilizer can be made available to the farmer. First is the perfection and expansion of the air-nitrogen industry to a point where it can produce cheap nitrogen, let us say, for example, at 5c. per pound, a figure that seems well within reach. Second, production of cheap phosphoric acid or its equivalent to replace the present low-grade (16 per cent) acid phosphate; and third, elimination of all low-grade plant food materials from the fertilizer industry in order to cut out the present excessive freight and handling costs. These changes involve, on the one hand, rather radical departures from present practices, and on the other, education of the farmer to use high-grade materials effectively. For both these reasons, the changes will come gradually as the result of numerous developments and economic adjustments.

Contact Filtration in Petroleum Refining

The oil refiners are showing increased interest at the present time in the use of the so-called contact process in the decolorizing of the lubricating oils, waxes and gasoline, by the use of fine fullers earth, rather than by the older method of using coarser fullers earth in percolating filters. Briefly, this process is to use either fine fullers earth—that is, earth ground to at least 80 per cent minus 200—or to use acid-treated clays that are now being prepared on the Pacific Coast and are said to have higher decolorizing power than the finely divided fullers earth. The fine fullers earth or clay is mixed directly with the oils to be treated, the oil having first been heated from a temperature of 250 to 300 deg. F., and agitated for approximately 15 minutes. The mixture of oil and clay is then pumped through a Sweetland or Kelly pressure filter in which the separation of the oil and the clay or fullers earth is made.

This process greatly simplifies the production of oil of a given color and eliminates the large volume of oil formerly held in the process, owing to the fact that when using the percolating system, it is impossible to get an oil of a given color without the blending of several batches of oil.

It is reported that the Eastern oil refineries are just beginning to realize the advantages to be gained by using the contact process, whereas the mid-West and Pacific Coast refineries have been doing a great deal of research work and have put a number of plants into commercial operation on this basis.

Industrial Progress Forecast by Chemical Research

Review of Important Papers Presented Before Seven of the Divisions of the American Chemical Society in Washington

Editorial Staff Report

THE general features of the Washington meeting have already been published in the April 28 issue of *Chem. & Met.* There remains to be published a review of the scientific papers presented. Manifestly it is impossible to abstract 500 papers and give any unified picture of the meeting. The following pages contain, however, reviews of those divisions that have some industrial background and affiliation.

Division of Industrial and Engineering Chemistry

A Few Papers Presented in Addition to the Heat Transfer Symposium and the Government Bureau Reports

Half of the time of the Division of Industrial and Engineering Chemistry was occupied with the Heat Transfer Symposium, already abstracted by W. H. McAdams in *Chem. & Met.*, April 28, 1924. The last day was devoted to the activities of federal bureaus relating to industrial chemistry, which has been described in recent years by *Chem. & Met.* and was discussed in some detail in the report of the meeting of the American Institute of Chemical Engineers, Dec. 5 to 8, 1923. There was, however, one session at which twelve general papers were presented, either fully or by titles. Of these, only four subjects covering seven of the papers need be mentioned here.

R. T. Haslam discussed "The Cementation of Iron by Silicon," and described the experimental work carried out in the diffusion of silicon into iron, when a steel pipe was placed in a powdered ferrosilicon alloy in an electric furnace. Various conditions were studied. It was found, for example, that the penetration reached a maximum at about 1,240 deg. C. and in about 3 hours time when a powder of 76 per cent silicon was used. This maximum penetration would take place either in hydrogen or nitrogen, but the penetration was so uneven that no commercial results could be obtained from it and deep pits often resulted.

W. G. Whitman and R. P. Russell presented two papers on corrosion work. The first was a critical review of methods of conducting corrosion tests, describing especially the rotating cylinder tests in use at Massachusetts Institute of Technology, and the second was a discussion of the effect of hydrogen-ion concentration on the submerged corrosion of steel. The conclusions were included in the paper reviewed in *Chem. & Met.*, April 28, 1924, p. 671.

R. E. Hall, of the Bureau of Mines, presented a most interesting review of some work on treatment of boiler water based on chemical equilibrium. The work was first undertaken by an analysis of different kinds of scale on boiler tubes, and five or six different types were differentiated, such as the sulphate, the sulphate carbonate, the carbonate silicate and the silicate type. These types of scale occur in different parts of the boiler. A novel instrument for studying the deposition of scale on pipe was developed and consisted essentially of a hot wire inside of a glass tube. As current was passed through the tube in contact with solutions of various kinds, different types of scale were produced. It was found to be desirable to eliminate materials from water that gave downward sloping solubility curves with increase of temperature. Such things as carbonate, bicarbonate and sulphate in general produce compounds that should not form scale, and in each case it could be shown experimentally and in practice that such was the case. Excellent results were obtained in some large boiler installations by this method of treatment.

The fourth paper referred to above was a discussion of the efficiency of fractionating columns by G. Calingaert. A study was made of coke-packed rectifying columns by using them to strip dilute ammonia solutions. An overflow of 8 to 23 kg. per hour and an amount of vapor varying from 2.7 to 17 kg. per hour were the operating conditions. Efficiency was found to be proportional to the time of contact and the higher capacity obtained with the largest overflow.

Division of Petroleum Chemistry

A Comprehensive Program Includes Discussion of Detonation of Motor Fuels, Refining Processes and the Results of Recent Research

The four sessions of the Petroleum Division were characterized by the wide variety of subjects under consideration—varying from such comparatively recent developments as the prevention of motor fuel detonation, the use of adsorbent carbons and helium repurification to such fundamental problems as fractional distillation and other refinery processes. The meetings were held under the skillful, good-natured direction of Chairman Ralph R. Matthews, of the Roxana Petroleum Corporation, assisted by the new secretary, Colonel George A. Burrell, of Pittsburgh.

Three papers dealt with the so-called anti-knock compounds for preventing detonation in the internal combustion engine. Gerald L. Wendt, as co-author with F. G. Grimm, of the research laboratories of the Standard Oil Co. (Indiana), outlined a very interesting theory for the mechanism of the action of tetra-ethyl

lead in reducing the velocity of combustion under high pressure in the automotive engine. Preliminary experimental results of these authors point toward an electrochemical explanation. It is argued that combustion releases electrons that travel at high velocities ahead of the flame front and are responsible for the detonation. It is well known that some of the heavier elements, including lead, have the property of absorbing free electrons. Accordingly if tetra-ethyl lead were to reduce the number of electrons in this way, it would serve to decelerate the flame propagation and therefore reduce knocking. Dr. Wendt described an apparatus in which he measured the "de-ionization" effect of lead on an ionized air and fuel mixture and thus obtained experimental results in support of his theory. He pointed out, however, that the method did not hold for the knock producers, the action of which he believed to be due to entirely different causes.

In the discussion that followed this paper Thomas Midgley, Jr., of the General Motors Chemical Co., said it was quite difficult for him to reconcile the fact that diethyl mercury, known to be a knock producer, actually showed anti-knock properties by Wendt's test. This did not, however, invalidate the theory, in Midgley's estimation, and he urged the prosecution of further investigation to demonstrate whether this theory or the chemical one proposed by Professor Haslam is the true explanation of the phenomenon.

T. A. Boyd, who has long been associated with Midgley in the work at Dayton, discussed the relative effect of some nitrogen compounds upon detonation. The singular behavior of nitrogen is well demonstrated by the fact that detonation is suppressed by aniline, affected very little by pyridine and is actually increased by propyl amine. In general, the primary and secondary amines are most effective in suppressing detonation and of these the aryl amines or those with at least one aryl group exert the greatest influence.

The third paper on detonation was that of Edward Sokal, in which was described a catalytic cylinder lining for an automobile engine said to yield "equivalent maximum power with decreased fuel consumption, together with the elimination of detonation." Although it is understood that there has been a number of independent investigations of the Sokal motor, the paper was passed without comment from the division.

Activated Carbon Extends Its Field

That adsorbent carbon is to find a constantly broadening application in the petroleum industry was pointed out by several speakers. O. L. Barnebey, of the Barnebey-Cheney Engineering Co., spoke of the physical requirements in various uses for carbon. The winning of gasoline from natural gas requires a granular adsorbent carbon, non-friable and of high quality. For high velocities of gas a coarse granulation (6 to 14 mesh) is best, while with diminishing velocities finer mesh carbon can be used to advantage. For testing purposes a medium granulated sizing is recommended. Dr. A. B. Ray, of the National Carbon Co., discussed the progress being made in the recovery of gasoline from still gases. The principal difficulty is due to the presence of sulphur in the gas and the fact that the carbon will precipitate the sulphur from H_2S and the organic sulphides. If the gases from the cracking stills are mixed with air, there is a considerable reduction in the precipitation. Further study of this problem is under way in the hope of providing a method by which the carbon can be completely regenerated either by removal of the sulphur from the carbon itself or by means of trapping the sulphur before the gas passes to the adsorber.

> In 1913 the petroleum refineries of this country handled 573,000 bbl. of crude oil daily, as compared with 1,587,000 bbl. each day during 1923—a gain of 176 per cent. During this same period the number of automobiles increased more than 1,100 per cent! How has this large apparent discrepancy between production and consumption been met? For the most part by the application of chemical engineering. Cracking processes have almost trebled the yield of gasoline per bbl. of crude oil. Better methods of production and refining have been developed and are being studied. It is this significant trend of technology that is reflected in many of the worth-while papers presented before the Petroleum Division.

Recent developments in the charcoal process for natural-gas gasoline were reviewed by George A. Burrell in the absence of C. L. Voress, whose paper was scheduled on this subject. Twenty plants are now operating on the so-called "dry" gas—i.e., gas containing 1 gal. or less of gasoline per thousand cubic feet. There are no installations at present operating on casinghead gas, since the rich gas generally heats the carbon too much to make it efficient. It is, therefore, usual practice to use the oil absorption process followed by charcoal recovery. Such an installation in connection with the Landreth oil absorption plant is now under construction in Texas. The principal advantages of the process are that it strips the gas as well at low as at high pressures and that it will produce from 15 to 35 per cent more gasoline.

Much interest was shown in a paper by W. A. Peters, Jr., of the du Pont company, on the "Separation of the Constituents of Petroleum by Fractional Distillation." He referred to an efficient laboratory column calibrated to be the equivalent of fifty plates, in which it is possible to study a petroleum mixture and to determine the effect of varying the heat expenditure as related to the efficiency of the column on the sharpness of the cut obtained. According to Mr. Peters, many petroleum stills have too many plates based on heat input—i.e., if the latter is held constant equally good results can be obtained with comparatively fewer plates. The amount of reflux does not affect column efficiency (in terms of theoretical plates), but it does have a marked effect on the efficiency of separation. Plant experience shows that the greater the reflux the greater the separation.

Vapor Phase Refining

A catalytic refining process of particular application to cracked distillates was described in an unusually comprehensive paper by Thomas T. Gray and M. R. Mandelbaum. The process is carried out in the vapor phase, the vapors being passed over an adsorption catalyst, which causes the objectionable diolefines to

polymerize into higher boiling products. Although these polymers are not retained by the catalyst, they can easily be fractionated from the distillate. Several catalysts, including fullers earth, nickelized fullers earth and silica gel, have been used, but because of its cheapness and the fact that it is already in use in the refinery, the authors prefer to use Florida fullers earth in 60 to 90 mesh. The loss due to the formation of polymers ranges from 0.1 to 0.5 per cent of the distillates.

It is possible in this way to produce satisfactory gasoline and burning oils from pressure distillates without acid treatment. In the case of high-sulphur oils a subsequent doctor treatment or alkali wash is usually necessary. In the commercial installation a tower 10x12 ft. containing 8 tons of fullers earth is used. Such a quantity of earth will treat 2,000 bbl. of distillate before revivification is necessary.

Developments in Petroleum Research

Several important papers were contributions from Robert E. Wilson and his associates in the research laboratories at Whiting, Ind. A. R. Fortsch discussed the viscosity of oils at temperatures above 250 deg. F. and presented curves covering determinations up to 495 deg. F. A method was outlined for interpolating the curves, which made it possible to obtain the viscosity of practically any oil derived from a mid-continent crude up to 550 deg. F. W. H. Bahlke presented a boiling point correction chart for normal liquids, with special application to petroleum products. The existing charts of the Bureau of Mines (Bull. 323)-were shown to be considerably in error.

A paper by C. E. Waters on the bichromate number of petroleum oils and one by H. H. Knoch, P. A. Crosby and R. R. Matthews on the determination of dilution of crank case oil reported some important advances made in analytical methods. Dr. William Yant, of the Bureau of Mines, spoke on carbon monoxide asphyxiation in private garages, outlining significant tests made at the Pittsburgh station. An informal discussion of recent developments in the recovery of helium from natural gas, which was given by Dr. R. B. Moore, of the Dorr Co., is referred to in the editorial pages of this issue.

Section of Gas and Fuel Chemistry

But One Session of This Section Held—Papers Included Coking and Producer Gas Studies

The Section of Gas and Fuel Chemistry began its program with a review of recent progress in the field of fuels and fuel technology by R. T. Haslam and E. W. Thiele, who summarized all of the important work of the past year. This review was based upon extended correspondence with approximately 300 investigators in this country and abroad. The authors pointed out that the utilization of powdered coal and studies of the constitution of coal were probably the two most important subjects receiving attention at the present time; but perhaps the most frequently mentioned subject is low-temperature carbonization. Further details of this summary will be presented in *Chem. & Met.* subsequently.

W. P. Ryan and H. B. Cobb reported on an experimental study of the rate of travel of the fusion zone in a coke oven. These investigators used both temperature and pressure measurements in exploration of the conditions within the mass of coal during carbonization. They conclude that the fusion temperature of the coal mixture studied is about 720 deg. F. and that in a coal mixture of this sort (28 to 29 per cent volatile matter) the temperature drop through the coking zone where the material is fused is approximately 340 deg. F. per inch. Using the pressure drop method, it was found that for a given gas flow through the test pipe, 4 in. of differential was sufficient until the fusion zone reached the orifice, when the pressure required jumps suddenly to 11 in. This method, therefore, is just as precise as the temperature method and much less expensive. Discussion of the paper brought out the fact that the thickness of the plastic zone varies from ½ to 1½ in. and the fusion point from 500 to 750 deg., depending upon the character of the coal.

The relation of coal composition to coke production was discussed by H. J. Rose, of the Koppers Co. He presented a very elaborate graphical summary of many hundred coking tests. The classification of coals with reference to coke characteristics requires a three-variable diagram to show percentages of carbon, hydrogen and oxygen. This investigator classifies the coking of coals in five groups: (1) High-oxygen coals, giving porous, light, weak cokes; (2) medium-oxygen coals of the type commonly used in gas manufacture, giving cokes of the "gas house" type; (3) dense-coke-forming coals, containing about 89 per cent carbon and 30 to 32 per cent volatile matter; (4) blocky-coke-forming coals, which produce a fine cell structure and a clean, strong coke, highly prized in metallurgy; (5) the low-volatile coals, which are so strongly expanding as not to be coked alone. The author concludes that full oven tests are still essential to forecast coke-making value, as the ratio of carbon to oxygen, hydrogen to oxygen, carbon to hydrogen and other features of the ultimate analysis, solvent analysis and other methods are by no means conclusive in sharply dividing coking coals into groups.

Methods of studying coke cell structure were described by O. O. Malleis, of the Koppers Co., who presented a large number of slides of typical cokes. This author recommends sectioning of the coke on an abrasive wheel and photographing full size as a means of recording coke structure. He pointed out that cokes varied in density from 0.75 to 1.24, having porosities from 38 to 58 per cent.

Producer Gas Formation

W. C. Ebaugh and students reported in two papers on the mechanism of carbon combustion. The conclusion was expressed that the oxidation zone of a producer is very thin and that carbon monoxide is formed with a very shallow fuel bed if reasonable contact with the incandescent fuel is obtained. However, the author's conclusion that carbon monoxide is the first product of combustion was not accepted by those discussing the paper, even on the basis of this author's own data. It was pointed out that the carbon monoxide was a secondary reaction product formed within a short distance of the initial point of combustion.

R. L. Brown reported on the disturbing influence of indene upon the determination of naphthalene by the

picric acid method. He pointed out that in many cases the percentage discrepancy might apparently be from 25 to 50 per cent in the apparent naphthalene content of the gas. Discussion by Fulweiler contrasted this conclusion with the practical fact that the old method of determination of naphthalene usually agrees fairly well with actual recovery of naphthalene on oil washing of the gas.

In a second paper, Brown reported upon the causes of indene production during water-gas manufacture. He concludes that poor cracking of the oil is the cause of indene formation. Operation on a basis to give good oil efficiency—that is, with sufficiently high temperature and adequate contact of oil vapor with refractory—would eliminate indene difficulty. This is of importance because indene is the principal gum-forming constituent of the gas which condenses in meters and piping.

Constitution of Coal

Various systems of coal classification based upon the constitution were discussed by Messrs. Thiessen, Fieldner, Ashley, David White, Rice, Parr and others. The first-named speaker explained why it is now generally believed that all the constituents of coal were formed from plant life through bacterial or fungus action. Cellulose is probably not the source of any of the coal substance, as all of the important constituents of coal can be accounted for more readily from other vegetable materials.

The classification proposed by Ashley was intended to be primarily for mixing of fuels and was not accepted generally by those discussing it as significant from a chemical point of view. Parr presented further information regarding his system of grouping of mid-continent coals on the basis of heating value and the ratio of percentages of the constituents.

Section of Paint and Varnish Chemistry

First Meeting of New Organization Shows the Increasing Interest in Paint Technology

If attendance and enthusiastic participation in the sessions of the newly organized Section of Paint and Varnish Chemistry are indicative of its success, the future of the section is assured. At the opening meeting on Wednesday as many as 250 chemists and paint technologists crowded to overflowing the room provided and made it necessary to move the meeting to larger quarters. The well-rounded program and interesting discussion from the floor bore testimony to the work of organization, the credit for which is largely due to the section's officers: Chairman, H. A. Gardner, director of the scientific section of the Paint Manufacturers Association, and secretary, W. T. Pearce, head of the school of chemistry, North Dakota Agricultural College.

A number of the papers had their origin in the paint and pigment laboratories of the Bureau of Standards. Percy H. Walker explained why that organization had adopted an inclination of 45 deg. with southern exposure for its test panels. Sunlight is the most important factor in the decay of paint exposed to the weather, and careful tests have shown that the unshaded south side of a structure receives more sunlight than any other side. For all latitudes in the United States north of Washington a surface facing south and inclined at 45 deg. gets 99.5 per cent of the maximum possible sunlight as compared with 65 per cent for a similar vertical surface with southern exposure. L. V. Pulsifer brought out in discussion that while the 45 deg. test was undoubtedly best for accelerated testing, his work with certain automobile varnishes had brought out the advantage of the vertical surface for tests involving many cycles of exposure. R. L. Hallet held that the vertical panel more nearly approximated actual conditions of exposure. However, the importance of acceleration in testing was emphasized by a number of other speakers.

Paints resistant to sulphide fumes are of particular importance in the chemical industries and therefore considerable interest attached to a paper on this subject by P. H. Walker and E. F. Hickson. A number of experimental paints were exposed to H_2S and $(NH_4)_2S$ in a hood for 24 hours. The results indicated that lithopone is a suitable pigment for interior paints and that mixtures of titanium pigment and zinc oxide are desirable for exterior paints. Lead even in traces should be absent. The use of cobalt rather than lead driers was recommended, since even 0.1 per cent of Pb in either pigment or vehicle resulted in darkening. Mr. Hickson and H. R. Snoke also reported observations on red lead as a paint pigment, outlining a satisfactory method of testing by flowing onto vertical glass plates. Paints with high acid number oils generally showed the largest amount of lead in the vehicles and also the greatest tendency to thicken at the end of 24 hours.

Effect of Metallic Driers

The final paper from the Bureau of Standards was that of L. L. Steele. This was based on a study of the relative catalytic drying action on linseed oil of lead, manganese, cobalt, iron and copper, together with certain combinations of lead with the four other metals. Lead alone is an efficient drier, but in combination with Mn and Co it is possible to use much smaller quantities of the latter metals. Copper greatly retards the time of drying.

H. A. Nelson and R. H. Wien, of the research laboratories of the New Jersey Zinc Co., have been studying the solubilities of metallic soaps—zinc and lead linoleates, resinates and tungates—in various volatile thinners either alone or in certain mixtures with linseed oil. The subject is one of very practical interest to the paint manufacturer, since this solubility actually determines the thinning obtained with a definite quantity of thinner. In these tests gum and wood turpentines, petroleum thinner (Varnolene), butanol and the two new German products, hexalin and heptalin, were used. Butanol showed the highest solubility; turpentine and Varnolene were next and their solubility curves were practically parallel. The hydrogenated products hexalin and heptalin had the least solubility.

Henry Green, of Palmerton, Pa., outlined the advantages of microchemical tests in determining the composition of such materials as leaded zinc oxide, particularly in distinguishing it from mechanical mixtures of zinc oxide and sublimed white lead.

A feature of the paint meetings was the symposium on the wetting power of paint and varnish liquids. The subject was introduced by Prof. W. D. Harkins, of the University of Chicago, who outlined the theoretical considerations involved in the spreading of liquids. J. H. Calbeck, director of research, Eagle-Picher Lead

Co., spoke of the practical application of these principles as affecting the oil absorption of pigments. Six factors which must be considered in this connection are: (1) voids to be filled in the pigments, (2) nature of surface of solid particles, (3) wetting power of oil, (4) specific surface or fineness, (5) geometric arrangement of solid particles and (6) time and temperature. The calculated quantity of oil based on the Harkins and Langmuir theories always falls considerably short of the quantity actually required in pigment grinding, indicating that particle size and specific surface conditions are not the only factors involved. Calbeck suggested that hexagonal or rectangular packing of the particles would account for the differences in the voids and therefore the differences in oil absorption values. F. G. Breyer, of the New Jersey Zinc Co., expressed the opinion that the packing arrangement was quite inconsequential, since pigment particles are not stationary but can be observed to be in constant Brownian movement. Furthermore, in all except the highest grade of enamels we do not find separate particles but rather mass accumulations.

Tung oil production in the United States, which has recently been referred to in *Chem. & Met.*, was discussed by H. A. Gardner. Trees in northern Florida have produced more than 3 gal. of oil which is superior in quality to that imported from China. This is due largely to care in pressing and handling. Large-scale experiments are now being conducted by the national associations of paint and varnish manufacturers and 25,000 seedlings grown from nuts have been planted during the last 2 months. It is expected that several hundred thousand more will be planted during the next 2 years with the idea of developing an American source for this valuable oil.

According to the last census 830 establishments made $340,346,830 worth of paint and varnish in 1921. Little wonder, therefore, that the A.C.S. newest baby turned out to be a full grown, healthy organization. The comprehensive program and the enthusiastic meetings of the newly formed Section of Paint and Varnish Chemistry bear testimony to the industry's appreciation of chemical and chemical engineering developments.

More Durable Auto Finishes

Varnish came in for its share of discussion in several outstanding papers. Prof. W. T. Pearce described the laboratory and exposure tests being carried on under his direction in the North Dakota Experiment Station. (See *Chem. & Met.*, vol. 30, No. 12, March 24, 1924.) Following a symposium discussion of physical methods of testing varnish, H. C. Mougey, of the General Motors Research Corporation, presented an interesting paper on automobile finishes. He declared that the tests at Dayton indicated that the real reason for lack of durability is due to the failure of the color and rubbing varnish coats used in present-day practice. No matter how good the finishing coat, it will not endure if undercoats are unsatisfactory.

In referring to recent developments in motor car finishing, Mr. Mougey cited the baking of black enamel on steel panels before the car body is assembled, the elimination of paint and varnish coats by the application of artificial leather and finally the use of cellulose nitrate lacquer enamels. The last named gives an extremely durable finish of the satin or dull type that at present seems to be more desirable than the high gloss finish. He cited its use by several large automobile makers in this country.

Division of Sugar Chemistry

A Number of Outstanding Papers on Sugar Mill and Refinery Problems Gave an Industrial Flavor to the Meetings

The Division of Sugar Chemistry reflected the technical progress of the various branches of the industry and the scientific advance of the laboratory. Perhaps a more complimentary statement can be made, but it is doubtful. Among the outstanding papers was one by W. L. Badger, of the University of Michigan. It was his aim to paint a picture of what happens inside of an evaporator, with especial emphasis on the variables that affect the rate of heat transfer. Many mistakes in evaporator design and operation would be avoided if these were better understood.

The rate of heat transfer in an evaporator is dependent on three things—the resistance of the steam film, the resistance of the tube wall and the resistance of the liquor film. The resistance of the tube wall is so small compared with other factors that it is almost negligible. On the other hand, the resistance of the films is very high and is modified by many factors. The steam film resistance varies with the velocity, the angle of impingement and the density of the steam, the content of non-condensible gases, the temperature of boiling and the presence of scale on the tubes. On the fluid side the film varies with the density, specific heat, viscosity, hydrostatic head, and shape of the liquor chamber. It can readily be understood why the multiple effect evaporator is a system in unstable equilibrium varying with the flux of heat transfer coefficients.

Some idea of the equilibrium in a given evaporator can be obtained by a set of simple equations based on the expression for heat exchange: H (heat) $=$ surface $\times$ temp. drop $\times$ k (rate of heat transfer). The heats in a given effect are equated—on the one hand the heat input and on the other hand the heat outgo. Similarly the heat outgo of one effect is the input of the next effect with obvious corrections. From a series of isothermal curves the value of k (the heat transfer coefficient) can be figured if θ (the temperature drop) is known. Therefore values of the various H's can be calculated and the equation will be satisfied. Or again from the data on the size of evaporators the heat equation can be satisfied by assuming successively different values for the temperature drop, reading from the curves the corresponding values of the heat transfer coefficient and solving the equation. In this way steam consumption, initial gage pressure and cooling water can be calculated for different methods of operating a given evaporator.

W. D. Horne, of Yonkers, N. Y., described his process for the superdefecation of cane juice. The present method consists of adding lime, but the end point is unsatisfactory. Too little lime gives incomplete precipitation and too much lime results in discoloration of sugar upon evaporation. The two effects unfortunately

overlap. By Horne's method a slight excess of lime is added to the juice till a point two-thirds of the way from litmus to phenolphthalein neutrality is reached and the mixture heated to 105 deg. if Louisiana cane is used, a higher temperature being necessary with Cuban cane. The juice is settled and decanted and is now slightly alkaline. To eliminate the alkalinity about 0.15 lb. P_2O_5 per ton of juice in the form of phosphoric acid is added and the precipitate of dicalcium phosphate settles rapidly. This is conveniently carried out in a Dorr clarifier. Less washing is necessary in the centrifugals and the final sugar has lower ash. Furthermore, the molasses production is diminished.

A paper by A. S. Elsenbast, of Celite Products Co., made an interesting comparison between filtration of limed juices on the one hand and of limed and sulphured juices on the other hand. It was found that by filtering raw juice, final liquor filtration was made infinitely easier and the use of Filter-Cel was cut in half. Figures were cited for filter area and quantity of Filter-Cel per ton of juice under varying conditions.

The well-known Petree & Dorr process for manufacturing raw sugar was described in detail by E. E. Hartmann, a sugar man of long experience who is now associated with the Petree & Dorr Co. The Petree process has been described in outline before, but it will be worth while pointing out that it is essentially a method of routing liquors through clarifiers and mills. The juice from the first mill, for example, is clarified and goes straight to the evaporators. The mud from the first clarifier is run on to the second mill and is extracted by the subsequent washing and extractions of the bagasse. The second mill juice is likewise clarified, the pure clarified liquors going with the first mill juice through the first clarifier, and the mud going on to the bagasse before it goes through the third mill. The advantages of the system are principally the elimination of the filter press station, a noisome source of infection. A claim of 8 to 10 per cent of fuel saving is made and it is also possible to run all of the clarification equipment with one man instead of between ten and fifteen in the filter press station. The cleaning of the evaporators is eliminated, one-half to two-thirds of the former centrifugal equipment is adequate, and the elimination of the bagacille from the juice gives a better keeping product. Mr. Hartmann answered a question on the loss of filter press cake as sugar cane fertilizer and pointed out that actually the potash could be obtained from the boiler cinder and that the actual losses in fertilizer value were very small.

C. F. Walton, Jr., of the Bureau of Chemistry, gave a series of results on inversion losses in cane sugar manufacture. One of the principal difficulties encountered was the absence of a good method of determining the acidity of a juice and it was finally decided to use the colorimetric measure of acidity. The studies were made to agree with plant conditions as nearly as possible and under these conditions it was found that with an acid concentration equivalent to a p_H value of 6.9 no inversion was obtained in the case of juices that had been limed and sulphited. With juices that had been limed only it was necessary to keep the acidity down below that figure.

K. R. Lindfors, of the Michigan Sugar Co., outlined the possibility of using surface tension as a measure of purity of sugar factory products. Under the conditions of work no relation had been found between purity and surface tension, although it was suggested that surface tension might be a good criterion for judging the keeping qualities of sugar.

W. B. Newkirk, of the Corn Products Refining Co., described a new baby in the sugar family, refined dextrose. There is nothing startling in the process up to the time when crystallization takes place. It is all standard sugar practice. In crystallizing there is considerable difficulty encountered, as there are three kinds of crystal forms possible and in order to produce a satisfactory article of commerce only one kind should be produced. The former practice was to boil the solution as in cane sugar work and to press the microscopic crystals thus formed free from liquor in a hydraulic press. They could not be separated on a centrifuge, as they were too fine. One of the great difficulties of making any improvement in the production of pure dextrose was that even though crystallization took place under conditions when the anhydrous material was unstable it would come down along with the hydrated material. It was almost impossible to control the form of crystals, the size or the number of grains.

Finally, however, a definite amount of wet seeding was tried on a supersaturation of a definite per cent. Conditions were controlled in the seeding process so that the crystal units spread through the entire mass and the liquor was cooled at such a rate that the crystal grains would grow. This process required rather a development as an art than as a science and the finger

After Addressing the American Chemical Society, President

tips of the sugar boiler are now educated, but the education was a very expensive one. The crystallizer is much the same as that used in cane sugar work, but it rotates with half the speed. Another precaution necessary in the production of pure dextrose is to use absolutely clear water in washing. Water must first be treated with alum, then sand filtered twice and finally charcoal filtered. The properties of dextrose make it interesting to certain industries. It is not as sweet as cane sugar and therefore has a distinct field in ice cream manufacture, where body rather than sweetness is desired. It will have a field in bakery work, cracker baking, in cake making and icing and in condensed milk. The crystals as produced now are 92 per cent dextrose and 60 per cent of them go through 200-mesh screen.

ident C d the Gathering and Was Included in the Group Picture

Division of Rubber Chemistry

Characteristics That Determine Filler Value of Compounding Materials, Aqueous Dispersions and Accelerators Feature Rubber Program

Practical technology and fundamental theory shared very nearly alike in the discussions of the Rubber Division. Methods of analysis of essential interest to the control laboratory, the influence of various accelerators and fillers on the finished product, and the recently developed water dispersion method were the main topics considered.

The possible use of American clay as a filler material has attracted attention for some time past. Of eighteen samples of such clays that have been tried out by several companies one was found to be superior, two equal, three slightly inferior and twelve distinctly inferior to other finely divided materials, such as zinc oxide. W. M. Weigel, of the Bureau of Mines, who reported these results, showed that the difference is not due to particle size, but that it apparently depends upon some other characteristic of the kaolin. E. M. Slocum outlined the possibilities of using American kaolin prepared by dispersion of the clay with the addition of a protective colloid to prevent agglomeration on drying. He showed that 10 parts by weight of such a clay may be used successfully without lowering the tensile strength of the product. Another paper in this connection was presented by H. A. Endres, of the Goodyear Co., who discussed the three factors determining the reinforcing effect of mineral fillers on rubber. Particle size is most important and directly governs the strength of the product if the dispersion of the filler is complete. Wetting of the particle by the rubber is essential, since if it is not thorough, agglomeration and lower strength result. Particle shape is least important, although if the size is considerable, properties dependent on the crystalline structure appear. Temperature may also be significant at times, as with carbon, where too much heat in milling causes sintering and consequent agglomeration.

Dr. J. B. Tuttle's two papers on the process for production of aqueous dispersions of rubber and compounds aroused much interest. The facts presented were essentially the same as outlined by Dr. Tuttle in *Chem. & Met.* for March 10, 1924. By introducing such a substance as glue into a compound in the presence of water, a complete dispersion results after mixing. The process does not demand long milling and it was stated that the presence of such a material as glue in the finished product is not injurious in most cases. Through the use of such a process the addition of oil or of low-grade rubber for softening previous to calendering may be eliminated.

The use of accelerators on a greatly increased scale has introduced the problem of proper consistency maintenance on the mixing rolls. The tendency to become stiff is frequently very troublesome, not being overcome always by the softening action that the accelerator itself usually exerts. Stanley Krall, after making plasticity tests on various samples that were compounded at different temperatures and with different accelerators, reported that in the temperature range of milling usually employed, 80 to 100 deg. C., diphenylguanidine increases the stiffness slightly, thiocarbanilide very decidedly. The addition of ZnO may either decrease or increase the plasticity. Apparently no general conclusions on accelerator behavior could be drawn, but in the discussion of the paper the idea was expressed that this is the sort of work needed for the development of improved accelerators.

G. S. Whitby and H. E. Simmons presented the results of another somewhat related study. Piperidine always has a decided boosting effect on vulcanization when not added in excess. Usually the amount required to convert the resin acids of the rubber into soap gives the maximum effect. Potassium hydroxide reacts in

the same manner, but much less vigorously. Substituted and unsubstituted aromatic amides have no appreciable accelerating effect. In connection with vulcanization a paper by C. W. Bedford was read by W. Jones, of the B. F. Goodrich Co., pointing out that aliphatic amines owe their accelerating effect to the formation of thiohydroxylamines that go over in the presence of metallic oxides to the corresponding salts.

Of the papers of interest primarily to the rubber laboratory, that by J. M. Bierer and C. C. Davis, of the Boston Woven Hose Co., was perhaps of most immediate value. The Geer test for aging rubber artificially involves the application of heat for a short period on the assumption that temperature is the chief factor causing deterioration. Believing that true aging is caused primarily by oxidation, the authors made about 11,000 tests to establish the facts. They found that by submitting samples to the action of oxygen under pressure (300 lb. per sq.in.) at a fixed temperature of about 60 deg. C., products resulted more nearly resembling those occurring in natural aging than did the products formed in the Geer test. Evidence was shown that was intended to prove that the physical properties of the samples aged in oxygen were a much more reliable index of deterioration than those properties imparted by the action of heat alone.

Leather and Gelatine Division

Studies on the Relation Between Chemical Composition of Leather and Shoe Comfort Feature of Interesting Meeting.

Of unusual interest to the general public as well as to tanners and shoe manufacturers were three papers presented before the Leather and Gelatine Division by John Arthur Wilson and Albert F. Gallun, Jr.

Why Shoes Are Uncomfortable

Experiments confirmed by wearing tests have demonstrated that the foot discomfort experienced by many persons with changing weather is due to concurrent variations in the leather in their shoes. Leather expands with increasing relative humidity and contracts when the humidity is reduced. The degree of change under fixed conditions of relative humidity is determined by the chemical composition of the leather. The greatest difference in this respect is found between chrome-tanned and vegetable-tanned leathers. With increasing relative humidity of the atmosphere from 0 to 100 per cent, chrome leathers increase in area from 16 to 21 per cent, against only 4 to 7 per cent for vegetable leather, corresponding shrinkages occurring when the relative humidity is again lowered.

In order to make actual wearing tests, eliminating all variables excepting the kind of tannage, calf skins were cut along the line of the backbone before tanning and one half of each skin made into chrome leather and the other into vegetable leather. For each person making the test, one pair of shoes was made from each half of the same skin, and he would wear the left chrome shoe and right vegetable shoe one day and the remaining pair next day. In a dry atmosphere, the chrome shoe invariably pinched the foot and caused a burning sensation. Upon walking out on a rainy day, the relaxation of the chrome shoe was very marked; in the dry room it was very much tighter than the vegetable shoe, but became very much looser after an hour in the damp atmosphere. The tighter structure of the vegetable shoes was responsible for their holding their shape better and presenting a much better appearance than the chrome after a period of wear. From the standpoint of the consumer, vegetable leather is much to be preferred.

All finished chrome leather contains a small amount of loosely combined sulphuric acid, and it was formerly thought that the gradual hydrolysis liberating free acid might be responsible for the discomfort experienced. Apparently the change in area is the real reason, although the acid may have an influence on this factor, for when the sulphuric acid combined with the chrome leather is replaced by vegetable tannin, the area change decreases, approaching that found with vegetable leather. The army upper leather used during the war, which was both chrome and vegetable tanned, changed in area about 12 per cent, which explains why it was more comfortable than pure chrome leathers, although not so comfortable as pure vegetable leathers.

Due to their much looser structure, kid leathers stretch to a much greater extent than calf leathers under the same load. For the same oil content, kid leathers are also much weaker than calf leathers in tensile strength. Increasing oil content has little effect upon the strength of kid leathers, probably because of their very loose structure, but the tensile strength of calf leathers increases directly with oil content, showing no point of maximum.

Contributions on Gelatine and Glue

Jay Bowman studied the plasticity of concentrated solutions of gelatine, mainly above 25 per cent, between 30 and 35 deg. C. Fluidity was found to decrease with time until the plastic stage was reached, there being a linear relation between the logarithms of the two properties.

Having obtained some high plunge gelatine, Clarke E. Davis and Henry M. Salisbury found by direct jell strength determinations the transition point of gelatine to be 38.2 deg. C.

Donald K. Tressler emphasized the necessity for the adoption of standard tests for grading glues. Permanence, adhesiveness and hygroscopicity are properties of first importance in glues to be used for joining wood.

Acidity of Tan Liquors

Ernest Little reported on a detailed study of the American Leather Chemists Association official method for acidity of tan liquors. Several sources of error were found and a new method was proposed. This involves the use of a cadmium half cell (see Pinkhof, *Chem. Weekblad*, 1919, vol. 16, p. 1168; Sharp and MacDougal, *J. Am. Chem. Soc.*, 1922, vol. 44, p. 1193), which constitutes the negative pole of the cell in circuit with a hydrogen electrode as the anode. In circuit with this cell there is a galvanometer together with a variable resistance to protect the galvanometer. The cadmium half cell is composed of a 12 per cent cadmium amalgam in contact with a cadmium sulphate and potassium iodide solution. By varying the concentration of KI the difference of potential existing between the cadmium amalgam and the cadmium ion can be regulated over a large range and so constructed as to correspond to end points of different p_H values.

Clear Fused Quartz

New Electric Furnace Process Makes Possible the Production of This Material in Large Pieces of Excellent Quality

By Edward R. Berry

Assistant Director, Thomson Research Laboratory, General Electric Co.

On Monday, April 28, at the Thomson Research Laboratory of the General Electric Co. at Lynn, Mass., there was demonstrated the manufacture of clear fused quartz in the electric furnace by a method that may justly be called a commercial one. Large masses of quartz, as free from bubbles and irregularities as the best optical glass, are produced rapidly in a radiation furnace recently perfected after many years of research. At this demonstration a batch of clear fused silica rod, as perfect in form as ordinary glass rod, was produced in 18 minutes from the time the current was applied to the cold furnace. Very small pieces of clear fused quartz have previously been made by enormously expensive methods, but it now becomes possible to produce large masses of it by a method that shows all the promise of low cost that the manufacture of Bakelite showed when it was first described by Dr. Baekeland. The raw materials are cheap and the power consumed is low.

Mr. Berry and his assistants have brought into the realm of commercial possibility a substance claimed to be the most transparent solid known, the best insulator, and the material with the smallest coefficient of expansion of any known substance.

Many applications of this material of construction are immediately apparent to the engineer. Others will undoubtedly appear as production increases. The author mentions some of the more important scientific applications and his description of the properties of clear fused quartz will suggest others.

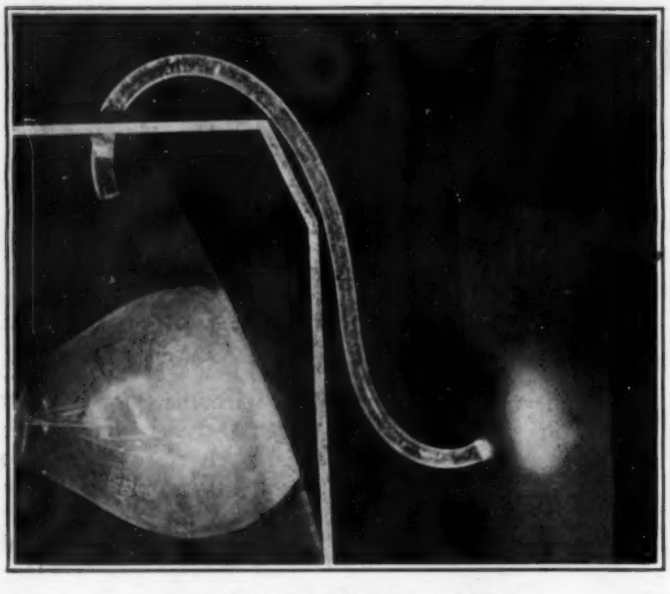
IT IS the purpose of this article to present some of the recent results of the development of clear fused quartz and to focus attention on some of the properties of this material, which are surprising, even though they may not be new. The art of making fused quartz dates back to 1839, when Gaudin, in France, discovered the general thermal properties of this material. Since then a number of advances in the art have been made by various investigators, but most of this work has been concerned with the opaque variety of fused quartz usually made from sand. It is only during the past 23 years that the development of clear fused quartz has made rapid progress.

It has been possible for many years to make fused quartz of high quality in small sections and lengths by hand labor in the ordinary blast flame, using gas and oxygen. This has been done by piecing together small sections of crystal in the flame, or by adding silica powder from time to time until the piece has grown in size to the limit of the flame's ability to heat it to the required temperature, an obviously slow and expensive process. From this step in the development of the art to the point where very large masses of equal quality can be made has been a long and a difficult process. In the last few years the advances made by the process described in this paper have been so rapid and far reaching that there seems to be no limit now to the size of high-quality clear fused quartz that can be made, except the limit that may be imposed by mechanical difficulties.

When it is desired to obtain fused quartz of high quality, it is necessary to start with the very highest quality of raw material, of which there is none better than water clear crystals. It is much more difficult to make fused quartz of this high quality from sand, even if its purity exceed 99 per cent. The rock crystal used in this work is water clear and contains probably less than 0.2 per cent impurities. The surfaces are often incrusted with iron oxide and other foreign material and the crystal itself can be seen to contain clusters of small bubbles. The crystal, therefore, is washed in acids and is then broken up and the unsuitable pieces are discarded.

There are two distinct steps in the preparation of these tubes, rods, ribbons and cane, the most important of which is the initial fusion. The clean quartz crystals, which are of various sizes, are packed as densely as possible in a graphite or carbon crucible so that during the cracking of the crystals, which is bound to occur as the temperature is raised, the parts cannot separate and allow any small amount of gas that may be present to enter the many crevices and thus form bubbles. These tightly packed crucibles are placed in a modified vacuum furnace and the temperature is raised as quickly as possible to the melting point. During this fusion the pressure in the furnace is kept as low as possible. The time required for fusion will vary, of course, with the conditions but not more than 45 minutes is necessary. The energy rate of fusion is from 3 to 8 kw.-hr. per pound of quartz, and the loss of quartz due to volatilization is negligible compared with other charges.

Presented at the Philadelphia meeting of the American Electrochemical Society, April 26, 1924.



Transmission of Light Through Rod
One end of a curved rod of clear quartz is inserted through a small hole in a box inclosing a lamp. The light entering the end of the rod travels along it and is emitted from the other end.

The result of this first fusion is a clear, transparent slug containing comparatively few bubbles ranging in size from a pin point to 2 or 3 mm. in diameter. Whether these bubbles have been formed by a gas or by silica vapor, it must be remembered that they have been formed at a temperature of about 1,800 deg. C., and consequently their pressure at room temperature is very small. This slug is now placed in another graphite crucible suspended in a vertical carbon tube furnace. A graphite piston that just fits the crucible is placed on top of the fused quartz slugs and a weight is placed on top of a plunger attached to the piston. The slugs are again brought to a fusion, the bubbles are largely collapsed and by the action of the weight the quartz is extruded in various forms, such as rods, tubes and ribbon. This material is practically free from bubbles, but because of limiting dimensions it may become necessary to re-work some of it. This is done by the usual bench methods with an oxygen-illuminating gas flame.

When it is desired to obtain large blocks as free from bubbles as the tubing, cane and ribbon, another operation is necessary. As before, the quartz is fused in a vacuum furnace, which is also designed to withstand very high pressures. As soon as the material is fused, the vacuum valve is closed and the pressure in the tank is brought up in less than a minute to a pressure depending on the object in view. This pressure collapses the bubbles and makes it possible to obtain very large slugs freer from bubbles than many kinds of the best optical glass.

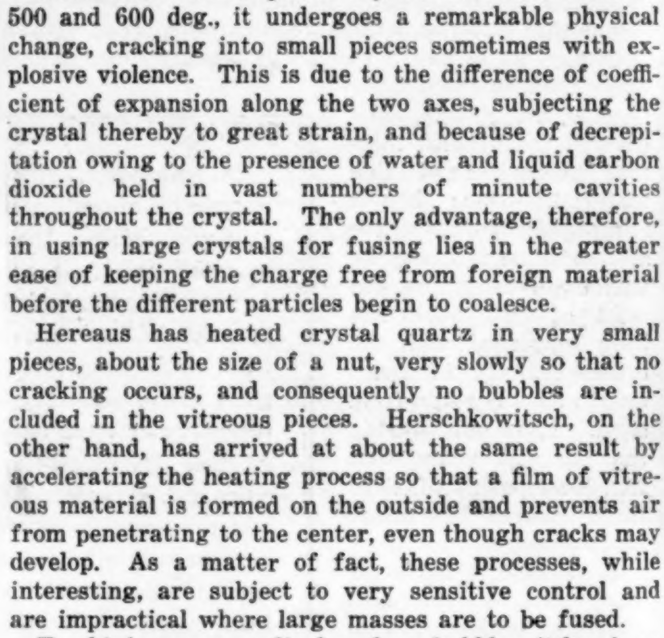
Previous attempts to reduce the bubbles by continued heating above the melting point resulted, after a certain stage, only in excessive loss of silica by volatilization. We have fused quartz at initial pressures of 600 lb. per sq.in. atmospheric pressure, and less than $\frac{1}{4}$ mm. of pressure. In the first case the mass was practically opaque; at atmospheric pressure it was considerably improved, although much inferior to the present quality of quartz; and under vacuum conditions a large mass can be produced which from the standpoint of number of bubbles is very satisfactory.

Not the least of the difficulties encountered in this development has been that in connection with the furnace equipment. The vacuum furnace in particular had to be greatly changed and enlarged, with the result that we now have probably the largest vacuum furnace in daily use capable of operating at low pressures. Then, in addition to this, the furnace had to be so constructed as to withstand repeatedly on the cover a total pressure of more than 1,000,000 lb. (about 600 tons), and of course as the size of the furnace increases these difficulties are multiplied. Special attention must be paid to the design of resistor unit, to the thermal insulation and even heat distribution, to the cooling of the terminals and many other factors presented in the use of these two extremes in pressure.

When the natural quartz crystal is heated between 500 and 600 deg., it undergoes a remarkable physical change, cracking into small pieces sometimes with explosive violence. This is due to the difference of coefficient of expansion along the two axes, subjecting the crystal thereby to great strain, and because of decrepitation owing to the presence of water and liquid carbon dioxide held in vast numbers of minute cavities throughout the crystal. The only advantage, therefore, in using large crystals for fusing lies in the greater ease of keeping the charge free from foreign material before the different particles begin to coalesce.

Hereaus has heated crystal quartz in very small pieces, about the size of a nut, very slowly so that no cracking occurs, and consequently no bubbles are included in the vitreous pieces. Herschkowitsch, on the other hand, has arrived at about the same result by accelerating the heating process so that a film of vitreous material is formed on the outside and prevents air from penetrating to the center, even though cracks may develop. As a matter of fact, these processes, while interesting, are subject to very sensitive control and are impractical where large masses are to be fused.

To obtain masses quite free from bubbles, it has been found best to raise the temperature rapidly to 1,400 or 1,500 deg. C., at which point the pieces begin to

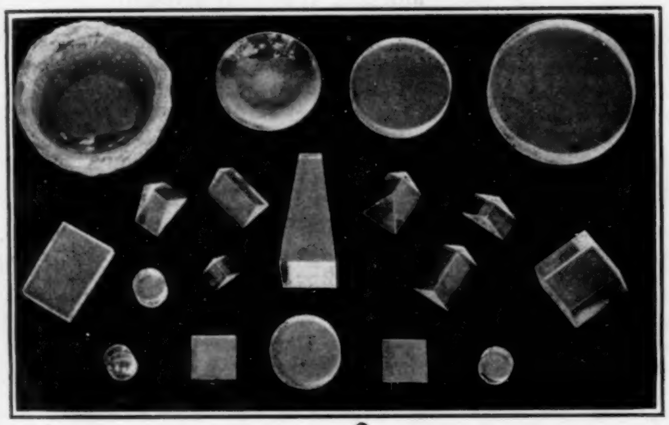


Transparence of Clear Fused Quartz
A printed page as seen through a cylinder 3 in. in diameter and 9 in. long.

coalesce. At about 1,750 deg. C. the quartz is thoroughly fused, though it is still very viscous. In fact, the viscosity is high even though the temperature be well over 2,000 deg. C. Vaporization of fused quartz is rapid at 1,600 deg. C., and at 1,750 deg. C. the loss due to evaporation is very great. Further increase in temperature results in no great gain in fluidity.

The difficulties of obtaining perfectly homogeneous fused quartz free from striæ, strain, bubbles and double refraction must be apparent to anyone who has worked on this problem, and discouraging perhaps to those who have tried to buy such material. It is a little too early to state in what quantities such a product can be produced, but we have manufactured large pieces of quartz of this quality that contained only two or three bubbles visible to the eye. This quality, however, has not as yet been placed on a commercial basis.

The facts that for a great many purposes clear fused quartz can be used up to 1,000 deg. C. without injury,



Lenses, Prisms and Cubes of Clear Fused Quartz

that its coefficient of thermal expansion is so small as to make it almost negligible and that it will transmit light rays even into the extreme ultra-violet with very little absorption give to it a great utility not only to the scientist but the manufacturer as well.

The specific gravity of clear fused quartz is 2.21; its coefficient of thermal expansion, 58×10^{-8}, is about one-seventeenth that of platinum and one-thirty-fourth that of copper; so small that a rod of quartz 1 m. in length will expand only about 0.6 mm. for a 1,000 deg. C. rise in temperature. The small probability of fracture under sudden changes in temperature, because of this property, makes it especially desirable for many uses. Furthermore, where it is used as a mirror in reflecting telescopes, this very small expansion or contraction with change in temperature causes almost no distortion of the image, and consequently much greater accuracy is made possible. This property also makes the grinding of a lens or mirror less tedious and costly, as it is not necessary to await the cooling of the shape in order to get the desired curve. It is possible to heat a tube of clear fused quartz say $\frac{3}{8}$ in. in diameter to melting point and plunge it into ice cold water without fracturing.

Its index of refraction for the *D* line is 1.459, and while its dispersion is higher than optical glass, it is more constant because of the smaller effects due to temperature changes. If the rays that have entered are nearly parallel to a rod of quartz, they are totally reflected internally and on account of this can pass around curves, unless the curves are too sharp. This property, coupled with a very small absorption loss, makes it possible to transmit light through very great lengths of curved rod or tubing with very little loss. A rod of this fused quartz 1 m. long will emit at one end about 93 per cent of the total visible light passed into the other end. For the better grades of optical glass the highest percentage transmitted under the same conditions is not more than 65 per cent; for ordinary glass it is about 35 per cent. It is the low transparence of glass that makes it impossible to transmit light lengthwise through a straight or curved rod of it.

The ordinary run of quartz made by this process and used in the fabrication of quartz mercury arc lamps will transmit light of wave lengths as low as the 1850 *A* line in the ultra-violet. At the opposite end of the spectrum, the heat rays also are transmitted with little loss. For example, if one end of a fused quartz rod 12 in. long is heated to incandescence, it will be found very uncomfortable to hold the finger over the other end, although one may comfortably grasp the rod a few inches from the heated zone. While clear fused quartz is a very poor conductor of heat, it transmits radiant heat, infra-red rays, very efficiency.

Clear fused quartz is the only known material that can be obtained in quantity and that is transparent to those rays in the ultra-violet that are so important not only in the treatment of diseased conditions but in the maintenance of our general health. It therefore occupies a unique position—one that is being recognized more and more by the medical profession.

It is well known that in the ordinary glass thermometers there is an appreciable lag in the glass, so that successive readings in a descending scale are inaccurate. To test the extent of this we have placed a standard glass thermometer and a quartz thermometer of our own construction in the same bath and raised the temperature to 515 deg. C. and then lowered it again to 0 deg. C. In this particular case the mercury in the glass came back to four divisions below the zero mark, whereas the mercury in the quartz returned exactly to its original calibrated mark at zero. While the capillary in the quartz tubing is not exactly uniform throughout its entire length, it is so uniform that a calibration of the tube over its whole length would eliminate any inaccuracies due to the slight nonuniformity.

It is known that as a standard of pitch the tuning fork is about the only appliance in use. As these are of necessity made of hardened steel, changes in pitch accompany temperature changes, but what is more important, on account of the work that has to be done in adjusting these steel forks to the desired pitch by grinding or otherwise working them, there are resultant changes in elasticity and dimensions resulting in disturbance of the note of actual pitch. A tuning fork of quartz is not subject to these changes to any appreciable degree.

This work has all been carried on in the research laboratory of the General Electric Co. at Lynn, and I wish to express my appreciation of the efforts of L. B. Miller and P. K. Devers, who in a large measure were responsible for the good results obtained.

Equipment News

From Maker and User

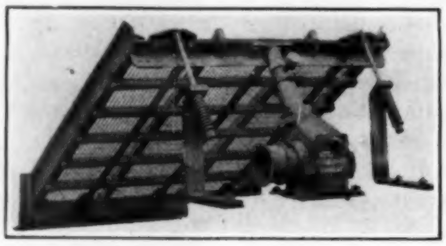
Mixing Device for Gas and Air

In firing industrial furnaces with gas, the importance of delivering to the burners a correct and thorough, intimate mixture of gas and air has long been recognized. Much effort has been concentrated on the development of devices for accomplishing such mixing. One of these is the McKee proportional mixer for high-pressure air—one of three different types of gas and air proportioning devices manufactured by the Eclipse Fuel Engineering Co., of Rockford, Ill.

The McKee unit is shown in the illustration. It is very simple in construction and consists of a special regulator or governor for reducing the line pressure of the gas to atmospheric pressure, a proportioning valve which admits gas from the line and air from the atmosphere in the desired proportions and a special injector with a diverging sleeve or pressure tube. A small stream of compressed air is forced through a minute orifice into the injector. This stream of compressed air is brought to the correct air-gas ratio by the admixture of a small amount of gas which is bypassed around the proportioning valve into the compressed air line.

The small stream of high-pressure air, thoroughly mixed with the correct amount of gas, passes through the injector at high velocity, producing a suction on the main part of the proportioning valve. As the handle controlling the flow of mixture is moved to the open position, gas and air are admitted in the correct proportions—gas through a rectangular opening and air through an opening carefully calibrated in a shape to correct for the varying resistance of the valve and other errors. The mixture thus made is claimed to be correct at all stages. Should the proportioning valve be closed entirely, there would still be the perfect mixture of gas and compressed air passing to the burners. As the valve is opened, a perfect mixture of gas and air should be admitted through the proportioning valve.

It is claimed that this system has many advantages. The single valve controls the flow of the mixture. It automatically maintains correct proportions of gas and air, which proportions are readily changed to handle gas of varying calorific value. The operation is entirely independent of furnace back pressure and the unit is easily adapted for use with automatic temperature control devices. High mixture pressures are easily obtained. It makes use of an air supply already available in most plants and uses only a small amount of compressed air—the proportion varying from 5 to about 15 per



Skeleton Type Vibrating Screen

cent of the total amount of air required for combustion.

The fuel economy is apparent. The first essential to perfect combustion is the maintenance of the correct mixture of air and gas for the work being handled. This ratio may vary from an excess of a fraction of 1 per cent of gas to give the proper reducing flame for metal melting or to prevent scaling of pots in pot furnaces, to a neutral or even oxidizing flame for other work. But whatever the desired proportions may be, they should be maintained along the entire range of adjustment. An excess of gas beyond the amount required to give the desired type of flame causes waste due to incomplete combustion. An excess of air, aside from being harmful in many operations, causes waste of fuel due to lower flame temperature as compared with that obtained when gas is burned under ideal conditions and to the fact that some heat which otherwise could be used is carried off with the waste gases.

Flame adjustments to bring about the desired results are automatically made. It is not necessary to depend upon the juggling of two valves by unskilled workmen whenever it is desired to make an adjustment of the flame. A considerable number of these units are in operation and are said to be successfully handling a variety of industrial heating operations.

McKee Proportional Mixer for Gas and Air

Vibrating Screen of Skeleton Type

The Sturtevant Mill Co., of Boston, Mass., has just completed the design of a new type of heavy duty "Moto-Vibro" screen of skeleton construction, built to place over a bin or hopper. This screen is of simple design, as all non-essentials have been omitted, leaving only the screen, its frame and vibrator, thus reducing its cost to a minimum. It is built primarily for sand and gravel, crushed rock, coal and similar substances to be screened wet, dry or damp and has a range of output from 2 in. to 10 mesh or finer.

The vibration is rapid and intense. Being graduated with maximum movement at the intake to minimum at the discharge, it gives greatest action at point of heaviest load. This action diminishes as the material lessens in quantity, thus giving greater opportunity to the granules nearer the size of the meshes to pass through as the load nears the bottom. All horizontal wires have vibration of equal amplitude from the extreme edges to the center. All vertical wires have equal vibration, but graduated, as above explained, from top to bottom; therefore the entire clothing at every point is equally efficient.

It is claimed that a 4x5-ft. screen can handle a feed of more than 50 tons per hour when putting through 25 tons of ¼-in. sand. With such a load, especially when damp, violence is required to break up mats which otherwise ride over the screen surface unscreened and at the same time vibrating amplitude must be regulated to prevent excessive flexing of the clothing, which would cause wire breakage. The accessibility, simplicity, capacity and price of the "skeleton" screen will interest engineers, and as it requires only 2 hp. to operate, it should have a large field of usefulness.

Manufacturers' Latest Publications

De Laval Steam Turbine Co., Trenton, N. J.—A new catalog covering the subject of centrifugal compressors and their application in gas, coke-oven and general industrial plants.

Spencer Lens Co., Buffalo, N. Y.—A new illustrated catalog describing a full line of scientific instruments such as microscopes, micrometers, delineascopes, and optical measuring instruments.

Crouse-Hinds Co., Syracuse, N. Y.—Bulletin 2057. A catalog of waterproof condulets with reflectors for use in industrial plants. Folder 12. A folder on condulets for concealing in concrete for use in concrete factory buildings.

Palo Co., 153 W. 23rd St., N. Y. City.—A folder on the new Palo Daylight lamp for use in duplicating daylight illumination in plants and laboratories.

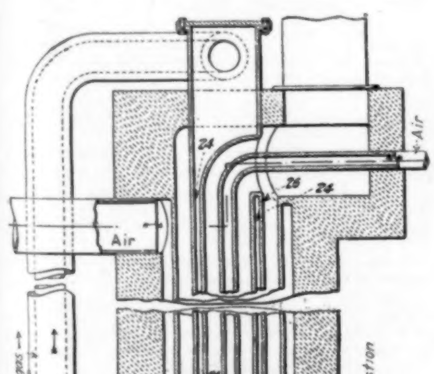
Review of Recent Patents

Carbon Black

Natural Gas Decomposed by Passing Through Heated Retort Having Small Cross-Sectional Area

Wilbur G. Laird, of New York, has developed a retort for the decomposition of methane or other hydrocarbon gas to form carbon black or gas black. It is well known that the yield of gas black from natural gas is about 3 lb. per 1,000 cu.ft., as against a theoretical figure of about 33 lb. This refers to the usual method of burning the gas and depositing the carbon on a cool surface passed through the smoky flame. Attempts have been made to decompose methane by heating in a retort, but the usual large cross-section of the retort has made it difficult to bring the entire stream of gas to the proper temperature and the product has thus undesired intermediate products of oily or gritty nature.

In the proposed process as described by Mr. Laird in Patent 1,490,469 (April 15, 1924, assigned to Henry L. Doherty) the retort is so designed that the methane or natural gas passes at comparatively high velocity through a passage of small cross-section. This passage, 24, is formed between two concentric carborundum cylinders, 26. The cylindrical retort is heated from inside and outside by burners using the hydrogen formed from the decomposition of the methane. The burners are so arranged that the highest temperature, 2,500 deg. F., is near the middle of the retort. While methane can be decomposed at 2,200 deg. F., it requires a much longer time than is afforded by the rapid passage of gas through the



Carbon Black Retort

retort, so that higher temperatures are required. Furthermore, these are necessary in order to decompose some of the intermediate products formed in the upper part of the retort.

Due to the comparatively high velocity, the carbon particles are swept out of the retort into the collecting chamber 56. Most of the carbon settles out here, but some is carried on by the hydrogen through a cooling and collecting system. A feature of this is the use of an ink or paint vehicle as scrubbing medium to recover the lightest particles of carbon, which are most difficult to remove. Gas black for use in making printers' ink and paints is commonly carried in a vehicle such as linseed oil, turpentine, castor oil, resin oil or mineral oil. Such a vehicle is used to scrub the gas, and the excess vehicle is evaporated off in a device that is part of the heat exchange system. It is claimed that by using a gas with uniform quantity of hydrocarbons, maintaining a uniform decomposing temperature and having the hydrocarbon in a thin stream of definitely controlled cross-sectional area, a product of uniform quality and color may be obtained.

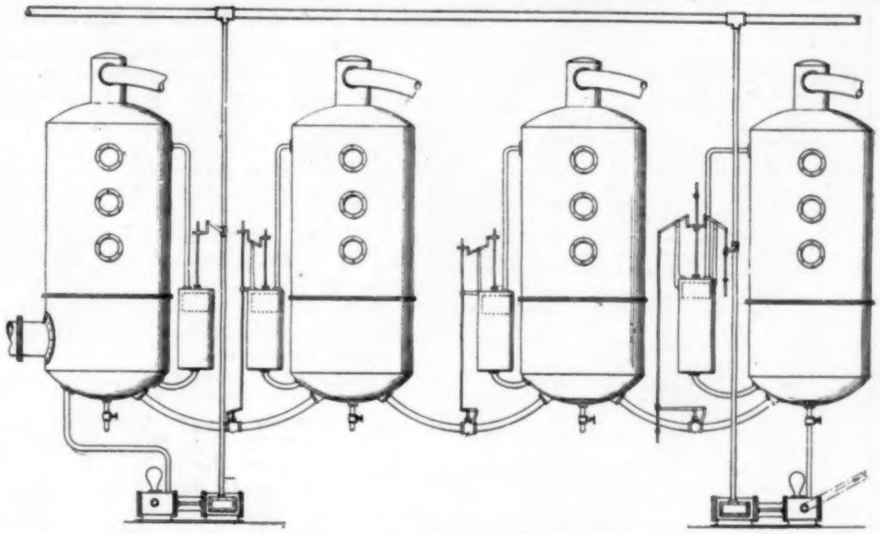
Automatic Control of Evaporators

Float-Operated Valves Maintain Constant Liquor Level in Multiple-Effect Evaporators

It is well known that the vacuum in a multiple-effect evaporator increases with each effect and that accordingly liquor would be drawn through the series toward the last effect unless some means is provided for controlling the flow. Under ordinary conditions this control is wholly manual.

William H. Johns, of Kingsport, Tenn., has developed a system of float-controlled valves whereby the level may be automatically maintained constant. Arrangement is also made so that the last effect may be wholly emptied before liquor is admitted from the preceding effect.

In a quadruple-effect, the operation is as follows: A float connected with the first effect controls a valve on the steam line to the pump and thus regulates the liquor feed. Levels are maintained constant in the second and third effects by float-operated valves on the lines connecting each effect with the one preceding. It is intended that the required degree of concentration shall take place almost completely in the first three effects, the last one acting largely as a trap for discharging the material, although, of course, a certain amount of evaporation will take place there. When the liquor in the last effect has reached the desired level, liquor connection between it and the third effect is cut off and a steam valve opened to start the discharging pump. When empty, the pump is stopped and the line from the third effect is opened. (1,490,743, April 15, 1924.)


Level Control System for Evaporators

Books Received

Aniline

ANILINE AND ITS DERIVATIVES. By *P. H. Groggins*. 256 pages, 29 illustrations. D. Van Nostrand Co., New York. Price, $4.

Chemical engineering data on the processes used in making coal-tar intermediates have not been available in any detail. This book fills a long-felt need in giving just such data on nitrobenzene, aniline and a number of derivatives, including sulphanilic acid, dimethylaniline, paranitraniline, hydroquinone, direct fast black E.W., phenylglycine, indigo, and rubber accelerators.

Colloids

COLLOID CHEMISTRY. By *The Svedberg*. American Chemical Society Monograph, 265 pages, illustrated. Chemical Catalog Co., New York. Price, $3.

Professor Svedberg's lectures given at the University of Wisconsin during

the spring and summer of 1923 have formed the basis for this monograph. Emphasis has been placed on quantitative investigations rather than on qualitative experiments, for it is the author's belief that a real advance in colloid chemistry is possible only by developing methods of accurate measurement for the study of colloids.

Nitric Acid

MANUFACTURE OF NITRATE ACID AND NITRATES. By *Allin Cottrell*, lecturer in technical chemistry, University of Edinburgh; lately acids manager, H. N. Factory, Gretna. 454 pages, illustrated. D. Van Nostrand Co., New York. Price, $10.

This forms Vol. VI of the new revised edition of Lunge. Nitrate of soda, manufacture of nitric acid from sodium nitrate and sulphuric acid, denitration of spent acids, mixed acids, industrially important nitrates (potassium, ammonium, calcium, etc.) and an acid and water balance for a nitration plant are among the important topics treated. Much information developed during the war at the great British acid plants has been incorporated in this volume, and an immense amount of practical operating data is included, making it by far the best available treatise on modern nitric acid practice.

Oil Field Technology

TEXTBOOK OF PETROLEUM PRODUCTION ENGINEERING. By *Lester C. Uren*, associate professor of petroleum engineering, University of California. 657 pages, 348 illustrations. McGraw-Hill Book Co., New York. Price, $6.

Petroleum production engineering is a field distinct from that of the petroleum geologist on the one hand and from that of the petroleum refiner. All phases of oil field technology from the drilling of the producing wells until the oil is in the pipe lines on the way to the refinery are covered in detail in this book.

American Patents Issued April 22, 1924

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests, and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

15,821 (Reissue)—Process and Apparatus for Drawing Sheet Glass. Julian H. Kendig, Edgewood, Pittsburgh, Pa., assignor to Libbey-Owens Sheet Glass Co., Toledo, O.

1,490,923—Can-Filling Machine. Oswald H. Hansen, Port Washington, Wis., assignor, by direct and mesne assignments, to Hansen Canning Machinery Corporation.

1,490,930—Glass Feeder. Richard LaFrance, Toledo, O., assignor to Owens Bottle Co., Toledo, O.

1,490,945—Apparatus for Separating Oil From Oil Shale, Etc. William R. Smith, Buffalo, N. Y.

1,490,946—Means to Produce Charges of Hot Glass. Leonard D. Soubier, Toledo, O., assignor to Owens Bottle Co., Toledo, O.

1,490,792—Resistance Thermometer. George F. Taylor, Washington, D. C., dedicated, by mesne assignments, to the citizens of the United States of America.

1,491,020—Tire-Shaping Press. Adrian O. Abbott, Jr., Detroit, Mich., assignor to Morgan & Wright, Detroit, Mich.

1,491,021—Process of Making Thiocarbonic-Acid Disulphide. Harold D. Adams, Naugatuck, Conn., assignor to Naugatuck Chemical Co.

1,491,026—Method of and Apparatus for Evaporating Liquid Substances. Richard G. Brindle, Chicago, Ill., assignor to Corn Products Co.

1,491,031—Apparatus for Agitating Foodstuffs and the Like. Frank Dalton Chapman, Berlin, Wis.

1,491,036—Vertical Retort for the Continuous Destructive Distillation of Carbonaceous Materials. Samuel Glover, St. Helena, and John West, Southport, England.

1,491,040—Process of Manufacturing Selenium Cells for Photo-Electric Work and Crystal Radiodetectors. Russel Hart, Alhambra, Calif.

1,491,049—Apparatus for Mixing Liquids. Frank Edward Lichtenthaeler, Newton Highlands, Mass.

1,491,064—Wire-Drawing Apparatus. Harley C. Ralston, Cleveland, O., assignor to American Steel & Wire Co. of New Jersey.

1,491,067—Glass-Feed Mechanism. John Rau, Indianapolis, Ind.

1,491,068—Method of Producing and Recovering Drift Salt. August Schilling, San Francisco, Calif.

1,491,069—Cane-Harvesting Machine. Henry O. Scranton, Jeanerette, La.

1,491,070—Cane-Stripping Machine. Henry O. Scranton, Jeanerette, La.

1,491,076—Process of Alcoholysis. Lloyd M. Burghart, Baltimore, Md., assignor to U. S. Industrial Alcohol Co.

1,491,079.—Device for and Method of Forming Ceramic Objects. Albert Champion, Flint, Mich., assignor to A. C. Spark Plug Co., Flint, Mich.

1,491,128—Method of Tube Welding. Richard O. Berg, Detroit, Mich., assignor to Michigan Steel Tube Products Co., Detroit.

1,491,131—Method of Operating Blast Furnaces. Ellery F. Coffin, Muirkirk, Md., assignor of one-half to J. H. McCauley, Laurel, Md.

1,491,133.—Centrifugal Extractor. Arthur R. Curtis, Cleveland, O.

1,491,140—Paper-Tube Making Machine. Joseph W. Holt, Brooklyn, N. Y., assignor to Union Paper Co., New York.

1,491,166—Method of Drying Milk. David D. Peebles, Eureka, Calif., assignor to Western Condensing Co., Eureka, Calif.

1,491,169—Heating Furnace. Charles H. Root, Parma, O.

1,491,180—Brick Kiln. Henry Webster, Newport, Ky.

1,491,224—Refractory Article and Process of Making the Same. Hugh S. Cooper, Cleveland, O., assignor to Kemet Laboratories Co., Inc.

1,491,228—Treatment of Silk and Composition Therefor. Edgar S. Genstein, New York, N. Y., assignor to Kem Products Co.

1,491,237—Process and Apparatus for Oxidizing Lead. John B. Huffard, Douglaston, and Pierre E. Haynes, Buffalo, N. Y., assignor to Union Carbide & Carbon Research Laboratories, Inc.

1,491,250—Electrolytic Manufacture of Colloidal Metals. Carl Hermann von Hoessle, Radebeul, near Dresden, Republic of Saxony, Germany.

1,491,265—Process of Halogenating Latex and Compositions and Articles Made Therefrom. Ernest Hopkinson, New York, N. Y.

1,491,282—Apparatus for Supplying Stock to Tire Builders. Adrian O. Abbott, Jr., and Clyde J. Smith, Detroit, Mich., assignors to Morgan & Wright.

1,491,290—Apparatus for Distilling Oil Shales and the Like. David J. L. Davis and George W. Wallace, New York, N. Y., assignors to S. E. Company.

1,491,313—Compound for Making Photographic Toning Baths. Paul Rehlander, Berlin-Charlottenburg, Germany.

1,491,369.—Glass-Manufacturing Machinery. Samuel E. Winder, Chicago, Ill.

1,491,380—Compound for Use in Connection With Baking Processes and the Like. Arthur John Clark, Walton-on-Thames, England, assignor to Glasgow & London Refining Co. Ltd., Moorgate, London.

1,491,381—Process for the Production of Glossy Metallic Coatings on Metals. Alexander Glassen, Aachen, Germany.

1,491,390—Manufacture of Sodium Citrate. Walter Glaeser, Brooklyn, N. Y.

1,491,408—Dentifrice. Rudolph A. Kuever, Iowa City, Ia., assignor to Pepsodent Co., Chicago, Ill.

1,491,429—Pneumatic Sizer. Albert H. Stebbins, Los Angeles, Calif.

1,491,430-31-32-33—Crusher, Screen, Dust Extractor. Albert H. Stebbins, Los Angeles, Calif.

1,491,456—Composition. Ovid P. Barbour, Winfield, Kan.

1,491,465—Production of Succinic Acid. Augustus E. Craver, Cliffside, N. J., assignor to The Barrett Co.

1,491,466—Bearing Composition. James L. Dillon, Leavenworth, Kan., assignor of one-half to Lee Bond and one-fourth to Otto Hesse, both of Leavenworth, Kan.

1,491,486—Evaporating Apparatus. Frank F. Marquard, Clairton, and Carl W. Littler, Swissvale, Pa.

1,491,498—Method of Electrolysis. Urlyn Clifton Tainton, Johannesburg, Transvaal, South Africa.

1,491,509—Web Guide for Paper Rolls. Genevieve L. Beals, West Orange, N. J., assignor to Math-O-Meter Corporation, Newark, N. J.

1,491,510—Fused Eutectic Salt Bath. Arthur E. Bellis, Springfield, Mass., assignor by mesne assignments to the Bellis Heat-Treating Co., New Haven, Conn.

1,491,518—Treatment of Petroleum. Lincoln Clark, Pasadena, Calif.

1,491,544—Evaporator. Donald Barns Morison, Hartlepool, England.

1,491,561—Process of Improving Glauconite. Arthur C. Spence, Washington, D. C., assignor to the Permutit Co., New York, N. Y.

1,491,569—Rubber-Tire Manufacture. Kenworthy J. Thompson, Mansfield, O.

1,491,587—Burner for Furnaces. Philip D'Huc Dressler, Zanesville, O., and Luther T. Strommer, Beaver, Pa., assignors to American Dressler Tunnel Kilns, Inc., New York, N. Y.

1,491,588—Process for the Production of Catalysts and the Product Thereof. Louis Duparc and Charles Urfer, Geneva, Switzerland.

1,491,672—Process for the Conversion of Synthetic Ammonia Into Solid Ammonium Chloride in Conjunction With the Production of Sodium Carbonate. Georges Claude, Paris, France, assignor to L'Air Liquide Société Anonyme pour l'Etude et l'Exploitation des Procèdes Georges Claude, Paris, France.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

News of the Industry

Summary of the Week

Official returns show sharp falling off in valuation of chemicals imported during March.

Wood-distillation operations apparently were on a larger scale in March than in February, as production of acetate of lime and methanol showed an increase.

Maximum increase in duty on nitrite of soda may be granted if Department of Justice reports favorably on legality of this action.

Indications are that Cramton bill for the establishment of a Bureau of Prohibition in the Treasury Department will be reported favorably.

Hearings on Muscle Shoals before Senate committee develop opposition to Ford offer.

Nitrate Producers Association of Chile would have American producers join the association, which has been renewed for 6 years.

Retail merchants in Canada ask Supreme Court to review the legislation which forbids the manufacture, importation or sale of oleomargarine in the dominion.

Producers and consumers confer with U. S. Bureau of Standards to develop standard methods for testing strength of dyes.

House Committee Expected to Report Favorably on Cramton Bill

Opposition From Industrial Consumers of Alcohol May Prevent Enactment of the Bill at Present Session of Congress

IF CONGRESS adjourns prior to the political conventions, it is practically certain that final action cannot be had on the bill providing for a Bureau of Prohibition in the Treasury Department. If, on the other hand, a recess is taken for the convention and Congress continues in session during the summer, the possibilities of its becoming a law are enhanced.

The Judiciary Committee of the House is considering this bill, which was introduced by Representative Cramton of Michigan, in executive session. As this is written, it seems practically certain that the bill will be reported favorably. The probabilities all are that the House will act in accordance with the recommendation of the committee. In the Senate, however, a very different situation exists. Neither the Judiciary Committee of that body nor the Senate itself will be inclined to accept the judgment of the House on this legislation without a thorough review of the facts on their own account. It is this condition which makes it apparent that the legislation cannot be enacted into law at this session, if it adjourns, as is planned, early in June.

Anti-Saloon League Influence Seen

The eagerness of the Anti-Saloon League to prevent the illegal diversion for beverage purposes of the small percentage of alcohol intended for industrial use very apparently has more weight with the committee than does the plea of the American Chemical Society, the American Institute of Chemical Engineers, the Paint, Oil and Varnish Association, the Synthetic Organic Chemical Manufacturers Association, the Manufacturing Chemists Association and other organizations and representatives of industry. It is very apparent that the committee is perfectly willing to interfere with the legitimate use of alcohol without regard for the business losses and the industrial confusion that will follow, as it is convinced that a small proportion of the alcohol withdrawn ostensibly for industrial purposes is finding its way into the hands of bootleggers. In this connection it is worthy of note that an amendment offered by Representative Cramton provides for a division of industrial alcohol in the proposed bureau of prohibition in charge of a graduate chemist and a person experienced in the production and marketing of industrial alcohol.

It must be recognized that the House itself will give no more consideration than did the committee to the contention of the chemical industry that the placing of all authority to regulate the handling of industrial alcohol in the hands of prohibition officials would add immeasurably to the burdens placed upon the many industries that must have a regular supply of this basic chemical essential. No attention apparently has been paid to the evidence showing that the industries are not opposed to prohibition. While there are some prohibitionists in the House who want to see the unnecessary handicaps removed from industrial alcohol, the number who are almost fanatical in their support of any measure purported to be in the interest of prohibition are sufficient to insure the passage of the Cramton bill. The opponents of the measure, however, are in a position to delay the progress of the legislation.

It is regarded as probable that the Senate will favor the removal of the prohibition unit from the Bureau of Internal Revenue and give it the dignity of a separate bureau in the Treasury Department, but it is believed the upper house will give serious consideration to the limiting of the jurisdiction of such a bureau to alcohol being used for beverage purposes. The Senate is more likely to be influenced by the fact that the Commissioner of Internal Revenue with his staff of experienced men are better suited to the handling of alcohol for legitimate uses.

German Potash Output Reduced by Closing Mines

Advices received at New York state that some of the large potash mines in Germany have discontinued operations. It is stated that these mines found it impossible to operate at a profit and sell at the prices now prevailing for potash salts. Competition from Alsatian potash has been keen for the past year or more, and this has forced curtailment on the part of German producers, with those mines where production costs are high forced to close down. It is not expected that the reduction of German output will have any effect on local markets, as supplies and offerings for the domestic trade are reported as ample for all needs.

All Offers Submitted for Muscle Shoals Meet With Opposition

Secretary Weeks and N. D. Baker Among Speakers Before Senate Committee Who Oppose Existing Offers

SUPPORT for the Ford offer for Muscle Shoals among members of the Senate Committee on Agriculture obviously is dwindling as testimony accumulates before the committee that this offer is insufficient in the returns to the government and inadequate as to its guarantees of performance. This is evidenced by the fact that although the hearings have been extended without limit, there has been no repetition of the threat of the Ford supporters to move on the floor of the Senate for discharge of the committee.

The first witness appearing before the committee who supported the Ford offer was Major E. B. Stahlman, publisher of the Nashville (Tenn.) *Banner*. He gave credit to Henry Ford for forcing the attention of the country to the rich possibilities of the developments at Muscle Shoals and declared the farmers of the South would derive great benefit from production of fertilizer by the proposed Ford corporation. It was developed through questions by members of the committee that Major Stahlman was not acquainted with the details of the other bills for the disposition of the properties.

During Major Stahlman's testimony he turned to W. G. Waldo, secretary of the Tennessee River Improvement Association, to answer one question asked by a committee member and Mr. Waldo's appearance led to a sharp exchange with Chairman Norris. Senator Norris asserted that the "sole purpose" of the association was to have Muscle Shoals turned over to Henry Ford and that its other activities, some of which the Senator admitted were beneficial, were only a masquerade for this purpose.

War Secretaries Oppose All Offers

Testifying before the committee, both Secretary of War Weeks and his Democratic predecessor, former Secretary Newton D. Baker, opposed the Ford offer and all other offers thus far submitted to Congress. Former Secretary of the Interior James R. Garfield opposed any lease not consistent with the terms of the federal water-power act.

Secretary Weeks favored creation of a committee or commission with authority to negotiate for the disposition of the properties. He opposed government operation. The Secretary defended his sale of the Gorgas steam plant to the Alabama Power Co. as both good business and good faith in executing a definite contract. Developments in long-range distribution of electric power and probable developments in nitrogen production made it inadvisable to tie up the Muscle Shoals properties with any corporation for 100 years or even for 50 years, he said.

At the request of Chairman Norris, Secretary Weeks repeated from memory a conversation he had with Henry Ford 2 years ago regarding that part of the Ford bid stipulating that the proposed corporation shall sell fertilizer at not to exceed 8 per cent profit. He asked Mr. Ford, the Secretary said, what would be done if fertilizer could not be produced profitably, and quoted the Detroit manufacturer as replying that in that event its production would cease.

Chairman Norris put into the record a telegram sent Mr. Ford's representatives by a Washington newspaper man quoting President Coolidge as desiring to "deliver" Muscle Shoals to Mr. Ford, which brought forth a denial from the White House and the statement from Secretary Weeks that he knew nothing of the matter.

Baker Favors Government Retention

Former Secretary Baker declared in favor of the government retaining the plants at Muscle Shoals and selling power at the power-house for distribution over a superpower system to make existing industries more efficient. He declared the Ford offer inadequate and said that a dozen offers along the lines of the Hooker-White-Atterbury bid could be secured. As for fertilizer production, Mr. Baker said it is probable that a chemical process for nitrogen fixation will be discovered before long which will make power a small factor in the situation.

Governor Pinchot of Pennsylvania opposed the Ford offer, declaring its acceptance would be a blow to the social and economic future of the South. H. W. Seaman, president of the American Mining Congress, also opposed the Ford offer.

Garvan Honored at Testimonial Dinner

Nearly all of the societies interested in chemistry co-operated in arranging the testimonial dinner in honor of Francis P. Garvan, president of the Chemical Foundation, held at the Waldorf-Astoria, New York, Saturday evening, April 26. For members of the American Chemical Society and the American Electrochemical Society, the dinner was the concluding feature of their respective convention week.

Dr. Edgar Fahs Smith acted as toastmaster and introduced Dr. George David Stewart, president of the New York Academy of Medicine, who gave a most interesting address on the relation between chemistry and medicine. Elon H. Hooker, president of the Manufacturing Chemists Association, presented the executives' view of the relation of the chemist to industry. Following a brief talk by L. H. Baekeland, president of the American Chemical Society, Brigadier-General Amos A. Fries made a powerful appeal for more universal recognition of the dependence of national defense upon the development of the chemical industries.

A few of the many messages from those unable to attend were read by Dr. Charles H. Herty, who then presented a magnificent silver loving cup to Mr. Garvan in appreciation of his service to the American chemical industry. Mr. Garvan responded with becoming modesty.

American Institute of Chemists Holds Annual Meeting

The second annual meeting of the American Institute of Chemists was held at the Chemists Club, New York, Monday evening, April 28. The code of ethics, previously published in *Chem. & Met.*, was adopted and it was decided that a permanent committee be appointed to interpret this code whenever the necessity arises. Dr. Horace G. Byers reported on the activities of the Institute for the past year and the work accomplished. State chapters have been organized in New York, New Jersey, Illinois and Pennsylvania, and three other chapters are in process of formation.

The address of the evening, by Dr. John C. Blake, national councilor for the Illinois Chapter and dean of the General Medical Foundation, Chicago, described the condition of the chemist and the manner in which the American Institute of Chemists can be of assistance to him.

The following national officers for the coming year were announced: President, M. L. Crossley; vice-president, Lloyd Van Doren; secretary, L. R. Seidell; treasurer, Clarence K. Simon; councilors for 3 years, H. G. Byers, H. B. Gordon and M. A. Hunter; councilors for 2 years, A. P. Sachs, William Walker and F. D. Crane; councilors for 1 year, Calm M. Hoke, W. Lee Tanner and Benjamin Harrow.

Calendar

AMERICAN ASSOCIATION OF CEREAL CHEMISTS, Curtis Hotel, Minneapolis, Minn., June 9 to 14.

AMERICAN CERAMIC SOCIETY, summer meeting and tour, July 21 to Aug. 18.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Denver, Colo., July 15 to 18.

AMERICAN LEATHER CHEMISTS ASSOCIATION, Spring Lake, N. J., June 18 to 20.

AMERICAN OIL CHEMISTS SOCIETY, New Orleans, La., May 5 and 6.

AMERICAN PAPER AND PULP MILL SUPERINTENDENTS ASSOCIATION, Dayton, May 22 to 24.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Cleveland, Ohio, May 26 to 29.

AMERICAN SOCIETY FOR STEEL TREATING, Moline, Ill., May 22 to 23.

AMERICAN SOCIETY FOR TESTING MATERIALS, Atlantic City, June 23 to 28.

CANADIAN INSTITUTE OF CHEMISTS, Queens University, Kingston, Ont., May 27 to 29.

MANUFACTURING CHEMISTS ASSOCIATION, annual meeting, India House, New York City, June 4.

NATIONAL ASSOCIATION OF PURCHASING AGENTS, Boston, May 19 to 24.

NATIONAL FERTILIZER ASSOCIATION, Kenilworth Inn, Asheville, N. C., June 9 to 14.

NATIONAL FIRE PROTECTION ASSOCIATION, annual meeting, Atlantic City, N. J., May 13 to 15.

NATIONAL LIME ASSOCIATION, White Sulphur Springs, W. Va., May 20 to 23.

WORLD POWER CONFERENCE, London, June 30 to July 12.

SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION, Boulder, Colo., June 25 to 28.

Washington News

Tariff Report Favors Higher Duty for Nitrite of Soda

An opinion has been requested from the Attorney-General by President Coolidge as to whether the Executive should issue a proclamation changing the rate of duty on sodium nitrite in view of the fact that a lawsuit involving this chemical as affected by the flexible tariff is pending in the District of Columbia Supreme Court.

The Tariff Commission has submitted its report to the President in the sodium nitrite investigation. The report is unanimous that the facts as to differences in costs of production in the United States and Norway, the principal competing foreign country, justify the maximum increase of 50 per cent in the present duty of 3 cents per pound under paragraph 83 of the 1922 tariff act.

The application for an increase in duty was filed more than a year ago by the American Nitrogen Products Co. of Seattle, Wash. A public hearing was held last September after agents of the commission had conducted an investigation in this country and in Norway.

After the hearing the Norwegian Nitrogen Products Co., a New York corporation which is selling agent for the Norse producers, filed a petition for a writ of mandamus to compel the commission to disclose cost of production data gathered in the United States. The commission had refused on the ground that these data were part of a trade secret. The court recently overruled a demurrer filed by the Norwegian company, alleging that the commission's answer to its petition was insufficient, thus indirectly upholding the position of the commission. As the Norwegian company may appeal from this decision or go to trial on the merits of the case, the lawsuit is not settled, and for this reason the President has asked the Department of Justice for an opinion as to whether it is proper for him to issue a proclamation in the nitrite case pending final disposition of the suit. Attorney-General Stone will give his immediate attention to this request and is expected to submit his ruling at an early date.

Will Contest Canadian Ban on Sale of Oleomargarine

Consul F. S. S. Johnson of Kingston, Canada, states that several dealers in Ontario are selling oleomargarine on the advice of the Retail Merchants Association of Canada, notwithstanding the national law against the possession, importation or sale of this product. It seems to be the general opinion throughout the Canadian trade that the government cannot pass prohibiting legislation against any wholesome article of food, such as oleomargarine, and this is the point that will be contested before the Canadian Supreme Court or the Privy Council, if the government accedes to the retailers' demands. The Retail Merchants Association has made a formal request to have the entire matter decided by the Canadian Supreme Court, so as to determine whether the manufacture, importation and sale of any food product into Canada can be prohibited.

March Production of Acetate of Lime and Methanol

The output of acetate of lime and methanol was larger in March than in February, according to figures issued by the Department of Commerce. These figures are based on reports made by manufacturers and they show that stocks on hand at the end of the month were larger than for the preceding month. Comparison of production figures and stocks is shown as follows:

	Acetate of Lime (in Lb.)		
	Production	Shipments (or Use)	Stocks, End of Month
Jan.	13,420,193	9,022,250	23,401,511
Feb.	13,172,610	8,548,032	27,622,967
March	14,107,411	9,027,539	32,370,329

	Methanol (in Gal.)		
	Production	Shipments (or Use)	Stocks, End of Month
Jan.	705,747	642,812	2,632,633
Feb.	689,503	681,057	2,738,308
March	741,505	617,949	2,749,818

American Interests Urged to Join Nitrate Association

The Nitrate Producers Association of Chile has voted to continue its activities for a period of 6 years, according to cable advices from Chile. With this action has come renewed pressure on the Dupont Nitrate Co. and W. R. Grace and Co., the two American producers, looking to their taking out membership in the association.

It is assumed that there will be no change in the policy of the American producers. Their position in the past has been that since the association is a monopoly engaged in the control of prices, their participation in such an activity would be contrary to the anti-trust statutes of the United States.

When the German producers proposed to stay out of the producers' association, the Chilean Government immediately exerted the pressure necessary to thwart such action. It is not regarded as probable, however, that any effort will be made to coerce the American producers into joining the association.

Apparently the producers of Chilean nitrate no longer are apprehensive of serious encroachment on their market by synthetic nitrogen. The loss of German business has been more than compensated by the increase in demand for Chilean nitrate in the United States. In Chile it is believed that Germany would be a large purchaser of nitrate at this time if funds were available for that purpose. It is fully believed that nitrate purchases by Germany will be resumed immediately on the rehabilitation of Germany's financial structure.

The general belief among producers in Chile continues to be that their product can be laid down at practically any consuming point at a lower price than can synthetic nitrogen, without lowering the rate of export duty now being paid. They are given additional confidence by the knowledge that this duty can be reduced or even removed entirely, should the necessity require.

Standard Methods Sought for Testing Strength of Dyes

How to develop a method to stimulate sunshine in its effects on fading fabrics is a problem which has just been put up to the United States Bureau of Standards by the textile and dye industries of the country. The appeal is based upon the present delay of months in testing the fading qualities of dyes. To overcome this delay and to shorten the test period would mean huge sums to the two industries, the bureau was told.

This request came about when representatives of manufacturers, chemists, colorists and consumers of dyes met with Dr. George K. Burgess and chemical and textile experts of the bureau to consider the development of three important steps: standard methods of testing the strength of dyes; a complete classification of the nomenclature in connection with dyes, and methods of testing the fastness of dyes on fabrics.

It was brought out that in other countries, notably Germany, standard names have been developed to cover certain dyes, regardless of whether they are made by one or several countries. In this country no such plan applies, and there is a possibility of wide confusion. In connection with the request for means to shorten the test period, there was emphasized by the Bureau of Standards the need for the adoption of grades and grade names by which the actual extent of fading can be stated in terms which the entire industry will understand.

Sanitary Production of Coconut Oil in Philippines

In answer to requests from Oregon and Washington, the War Department has stated that sanitary conditions prevail in the handling and crushing of copra in the Philippine Islands. Controversy had arisen in those states relative to the use of Philippine coconut oil in food products. Requests for information from the War Department brought a cable from Leonard Wood, Governor-General of the islands, which said that charges that Philippine coconut oil is unwholesome from a sanitary standpoint are entirely without foundation. Vegetable oils produced in the Philippine Islands are prepared in a thoroughly sanitary way and are entirely fit for human use and consumption. Oil mills operating in Manila have just been specially inspected by health service doctors and found in good sanitary condition.

News in Brief

Zinc Institute Elects Officers—Arthur E. Pendelari, vice-president of the Eagle-Picher Lead Co., Joplin, Mo., was elected president of the American Zinc Institute at the closing session of the sixth annual convention in St. Louis. A. F. Cobb and John E. McCarthy, both of New York, and Jeffee G. Starr, of Joplin, Mo., were elected vice-presidents. Howard Young was re-elected treasurer and F. S. Tuthill was re-elected secretary.

Peru Will Refine Metals—Steps are being taken to introduce methods to refine metals in Peru instead of continuing the practice of spending large amounts of money abroad for this work. Accordingly a decree has been issued appointing German D. Zevallos, a member of the Cuerpo de Ingenieros de Minas, to study the methods employed in the United States, with the object of establishing in Peru plants to use similar processes.

White Lead Producers Cited—Unfair methods of competition in the alleged misbranding of their paint products is charged by the Federal Trade Commission in complaints issued separately against Lewis Leavitt and James A. McCafferty Sons Mfg. Co., Inc., of New York. The complaints allege that the respondents sell a product labeled "gold seal combination white lead" which is not composed of more than 1 per cent of sulphate of lead or carbonate of lead. The complaints state that the term "white lead" is commonly used by the trade and general public to designate sulphate of lead or carbonate of lead.

Glass Plants Will Operate Through Summer—As a result of a conference between flint glass manufacturers and the organization of operatives at Millville, N. J., it has been decided to suspend the regular summer curtailment for the 1924 season, continuing the plants in operation. Heretofore, it has been the practice to close the factories from July 15 to Sept. 1.

Conference of Salt Interests — The State Department of Health, Lansing, Mich., is arranging a conference of salt manufacturers in the state, with primary purpose of establishing a working basis for the mixing of iodine with salt distributed in Michigan. It is expected to impress the 1925 State Legislature with the necessity for such treatment of salt and have a proper law enacted to make such compulsory. The fundamental reason for the action is stated to be the prevalence of goitre in the state, held as the result of the absence of iodine in drinking waters. It is purposed to mix with the commodity an average of 45 mg. of calcium iodide to 1 lb. of salt.

Fire in Oil Tanks — The General Petroleum Corporation, of Los Angeles, Calif., sustained a loss approximating $200,000 by fire at its tank farm located just outside Taft, Calif. Two 55,000-bbl. tanks full of crude oil were a total loss and two of 37,000 bbl. capacity each were a 30 per cent loss. The origin of the fire is presumed to have been a flashback from probably a mile away while men were welding, with an acetylene torch, a pipe connecting with one of the tanks, although the company rule is that no welding shall be done on a line connecting with a tank while the valves are open.

Nitrogen Fixation in Austria—A report from the U. S. assistant trade commissioner at Vienna says a conference recently took place at the Chancellery which was attended by the Austrian Ministers of the Interior, Finance, Commerce, Army and Agriculture, as well as by chemical and technical experts, relating to a project brought forward by foreign interests to establish a large-scale nitrogen industry in Austria. The nitrogen is to be derived from the air, using the Roos-Lutz process. It is said that the proposed project met with approval. No action was taken at the meeting, as it was decided to ask for further details of a technical nature.

Ore Rates for Zinc Concentrates—"Ore" rates should have been applied on shipments of zinc concentrates from New Mexico points to Palmerton, Pa., in the opinion of Interstate Commerce Commission Examiner Mackley in a report to the commission on a complaint brought by the New Jersey Zinc Co. The carriers contended that the commodity description "ores" does not apply to concentrates.

March Imports of Chemicals Showed Marked Falling Off in Value

Coal-Tar Chemicals Prominent in the Decline— Exports Continued in Line With the Totals for February

IMPORTS of free list chemicals showed a marked decline during March, figures just compiled by the Department of Commerce show. In February free list chemicals to the value of $12,048,100 were imported. In March this total fell to $9,143,770. The March total for dutiable chemicals was $2,630,374, slightly in excess of the value of dutiable imports during February. The decrease, however, in free-list imports is the result of decreased values. These imports continued in practically the same volume. In February fertilizer imports totaling 238,341 tons were valued at $9,346,391. In March 227,341 tons were valued at $7,943,805.

Imports of sodium nitrate fell from 150,000 tons in February to 115,919 tons in March. Calcium cyanide fell from 14,304 tons in March to 3,383 tons in February. For the first time in several months March saw the importation of 1,420 tons of sulphate of ammonia. There was a general increase, however, in the imports of potash fertilizers. Receipts of muriate were 14,294 tons; of sulphate, 6,782 tons; of kainite, 38,903 tons; of manure salts, 21,652, of other potash-bearing substances, 3,042 tons. With the exception of crude sulphate, each of the foregoing items represents a substantial increase in February.

Coal-Tar Imports Decrease

Imports of coal-tar chemicals slumped decidedly in March. The receipts during that month were valued at $954,067, only a little more than one-third the amount of February receipts. On the other hand, there was an increase in imports of colors, dyes and stains. The March total was 382,921 lb., as compared with 277,980 lb. in February. The value of imports of paints, pigments and varnishes decreased in March. Imports under that head were valued at $217,575, as compared with $231,813 in February.

The imports of certain chemical commodities during March, 1924, with revised comparative figures for March, of last year, follow:

	March, 1923	March, 1924
White arsenic, (lb.)	1,392,289	2,181,900
Citric acid	152,880	70,228
Formic acid	129,298	156,432
Oxalic acid	228,025	241,857
Tartaric acid	100,352	303,418
Copper sulphate	....	1,087,096
Potassium carbonate	1,039,210	294,562
Potassium hydroxide	832,034	1,113,035
Potassium chlorate	....	610,621
Sodium cyanide	3,103,539	4,121,420
Sodium ferrocyanide	129,475	420,320
Sodium nitrite	845,651	758,433
Dead or creosote oil (gal.)	5,170,004	2,028,841
Naphthalene (lb.)	2,492,922	1,084,008

Exports of chemicals and allied products during March were valued at $9,456,427. This is at substantially the same rate of exportation maintained during February. Coal-tar products to the extent of $921,966 were exported during March, a decrease of $11,000.

The exports of sodas and sodium compounds aggregated 24,814,060 lb. during March, a falling off of 1,500,000 lb. The value of paints, pigments and varnishes exported in March was $1,300,026, $75,000 less than the February exports.

Fertilizer Exports Decline

There was a decline in exports of fertilizers and fertilizer materials. The March figure was 73,093 tons. In February 86,942 tons was sent out of the country. Exports of sulphate of ammonia, however, which were 11,325 tons, continued at the February rate. The decline was confined largely to the phosphate materials. In exporting 1,515,342 lb. of explosives in March, the February rate practically was maintained.

The comparative figures covering the export movement of certain chemicals are as follows:

	March, 1923	March, 1924
Benzol (lb.)	13,444,274	6,538,661
Acetate of lime	1,962,763	1,622,341
Bleaching powder	2,589,072	1,318,383
Chlorate of potash	24,361	14,827
Bichromate of potash	1,033,857	87,035
Cyanide of soda	273,320	307,485
Sulphate of ammonia (tons)	12,951	11,325
Soda ash (lb.)	2,420,934	2,076,300
Caustic soda	9,855,416	5,997,383
Sulphuric acid	702,355	602,817

Men You Should Know About

E. W. ALLEN, formerly engineer and assistant manager of the Central district of the General Electric Co., with headquarters in Chicago, has been appointed manager of the engineering department of that company, according to a recent announcement by Francis C. Pratt, vice-president in charge of engineering. A. F. RIGGS has been named district engineer to succeed Mr. Allen.

Dr. F. W. ASTON, fellow of Trinity College, Cambridge, is to deliver the annual address before the Institute of Metals on June 4. The subject will be "Atoms and Isotopes."

M. G. BABCOCK has become connected with the Pittsburgh Plate Glass Co., Pittsburgh, Pa., in the refractory department, to act as assistant to A. H. Chandler, manager. Mr. Babcock has a Master's degree in ceramic engineering and a silicate fellowship at the Mellon Institute of Industrial Research. In connection with the latter, he was engaged several years in original research on glasshouse refractories. He was formerly connected with the Laclede-Christy Clay Products Co., at the Pittsburgh office, and recently resigned.

F. H. BALLOU has been appointed general engineer of the American Beet Sugar Co., with headquarters at Denver, Colo.

F. CRABTREE, head of the department of mining and metallurgy at the Carnegie Institute of Technology, has been elected to the presidency of the Engineers Society of Western Pennsylvania.

W. V. CRUESS, associate professor of the department of agriculture, University of California, was in Chicago recently, on his way back to Berkeley, after an extended tour in Europe, where he has been studying processing methods in the olive industry of Spain and Italy.

H. C. FULLER, of the Institute of Industrial Research, Washington, D. C., sailed for Europe on the "Leviathan" May 3. He expects to spend about 2 months in France and Italy and will attend the Fourth Congress of Industrial Chemistry at Bordeaux June 15, as a delegate from the American Chemical Society. He will also attend the International Union of Pure and Applied Chemistry at Copenhagen, June 26 to July 1, as a representative of the National Research Council.

W. T. LONG, formerly at Edgewood Arsenal, has resigned to accept a position with the U. S. Industrial Alcohol Co. research laboratory, Baltimore, Md.

A. C. LYON, who has engaged in testing laboratory work in Kansas City for a number of years, will spend the next few months in western Montana installing a plant for the recovery of platinum.

RALPH M. MCLELLAN, vice-president and general manager of the Deford Co., Baltimore, Md., sole and leather belting tanner, has resigned.

O. J. SHIERHOLTZ, formerly chief chemist of Robson Leather Co., Oshawa, Ont., Canada, has joined the technical staff of the Commercial Solvents Corporation at Peoria, Ill.

H. N. SPICER, of the Dorr Co., expects to sail on June 4 for an extended European trip, combining a holiday with business.

M. W. STROUD, president of the American Gas Co., Philadelphia, Pa., has been elected chairman of the board of directors of the National Power Securities Corporation.

Prof. ELIHU THOMSON, one of the founders of the General Electric Co., sailed April 26 on the "Comte Verdi" for a 3 months tour of European countries. While abroad he will receive the Lord Kelvin gold medal, which was recently awarded to him. The presentation will be made early in June in London. This award, made through joint action of British and American engineering societies, occurs every 3 years and is a mark of distinction for excellence in research work in engineering. Professor Thomson is the first American to receive the honor.

FRANK VALENTINE, of the M. D. Valentine & Brothers Co., Woodbridge, N. J., manufacturer of firebrick and refractories, is planning a trip to the Panama Canal, Pacific Coast and Canada, and will be absent about 2 months.

Obituary

Dr. ERNEST FOX NICHOLS, director of pure science research in the Nela Research Laboratory of the General Electric Co., died suddenly in Washington, April 29. He was stricken while presenting a paper before the annual meeting of the National Academy of Sciences. In addition to his important paper demonstrating new radio waves, Dr. Nichols had on display a clever piece of apparatus which made it possible to visualize the pressure exerted by a beam of light.

Ernest Fox Nichols

Dr. Nichols was born in Leavenworth, Kan., June 1, 1869, the son of Alonzo Curtis and Sophronia Fox Nichols. He won his first degree as Bachelor of Science at the Kansas Agricultural College in 1888, took the Master of Science at Cornell in 1893 and the Doctor of Science there in 1897 and subsequently was a graduate student of physics at Cornell, the University of Berlin and Cambridge University, and received honorary degrees from Dartmouth, Colgate, Clark, Wesleyan, University of Vermont, University of Pittsburgh and Dennison.

Dr. Nichols married Katherine Williams West, of Hamilton, N. Y., on June 16, 1894, while a member of the faculty of Colgate University. He held chairs as professor of physics at Colgate, Dartmouth, Columbia and Yale, and was president of Dartmouth from 1909 to 1916.

In 1920 he resigned his chair at Yale to become director of pure science in the Nela Research Laboratory at Cleveland. Within less than a year, however, he was offered the presidency of the Massachusetts Institute of Technology. He accepted, but held that position only a few months, returning to Cleveland to resume his work at Nela Park.

During these wide activities Dr. Nichols was research associate of the Carnegie Institution of Washington and during the war rendered valuable services to the Bureau of Ordnance of the Navy Department.

LINDON WALLACE BATES, of Mount Lebanon, N. Y., an engineer who achieved international note as an expert on waterways, died in Paris, France, April 22, from a stroke of paralysis, after a 3 years illness. His body will be returned to the United States, to be placed beside that of his son, Lindon Bates, Jr., who lost his life in the sinking of the "Lusitania" in 1915. He was born on Nov. 19, 1858, and was educated in Central High School, Chicago, and Sheffield Scientific School at Yale. Mr. Bates took an active part in the discussions concerning the Panama Canal, being one of the advocates of a low-level canal. Soon after his work was completed, Mr. Bates retired from active life, only to return to it again during the war, first as vice-chairman of the Belgian Relief Commission under Herbert C. Hoover and later as chairman of the engineering committee of the Submarine Defense Association. In the course of this work he developed a method for producing colloidal fuel, a stable suspension of powdered coal in fuel oil.

C. C. BURNS of Watertown, N. Y., a prominent paper manufacturer of that district, died in New York, April 21, aged 56 years. He had suffered from ill health for some time.

CHARLES W. LUFF, secretary and assistant treasurer of the Great Western Sugar Co., Denver, Colo., died recently in that city at the age of 46 years. He had been connected with the company in various capacities for the past 23 years. He is survived by his wife and a daughter.

Consumption of Chemicals Moderate in April

Producers Continue to Operate on a Reduced Scale—Market Values Fall to Lower Average Levels

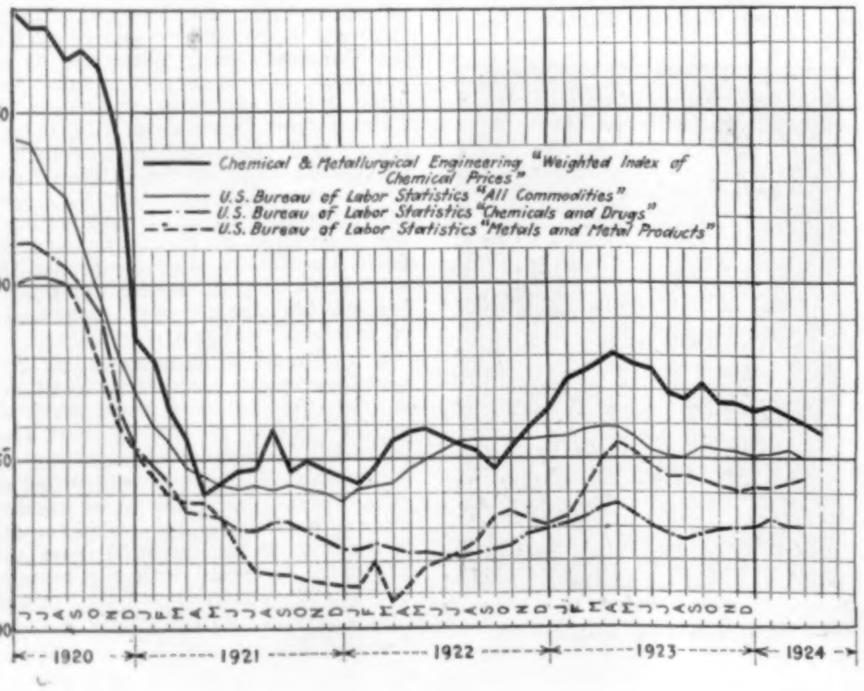
There was little if any improvement during April, in the position of trades which are large consumers of chemicals. Many textile plants continued to run on reduced schedules and similar conditions were found in the leather industry. Other consuming lines were practically on the same basis as in the preceding month. In comparison with the corresponding period last year, this means a lower production and consumption of chemicals. This is substantiated by a summary issued by the Federal Reserve Board in which it was stated that March showed a decrease in the production of basic commodities; a recession in wholesale prices; and less than the usual seasonal wholesale and retail distribution. The board's index of production in basic industries declined 3 per cent in March.

The movement of chemicals and allied materials against contracts was fairly steady throughout April. Call for fresh commitments, however, was quiet and trading in the open market was along moderate lines. There is some difference of opinion regarding the volume of stocks carried by producers and consumers. It is generally held that producers are well supplied in spite of reduced outputs, but consumers are thought to be working on light stocks and this is regarded as the forerunner of active buying as soon as business conditions improve.

The Department of Commerce has just issued figures covering the import and export trade in chemicals for March. Exports in that month were practically the same as in February. Imports declined sharply from the February totals but the comparison is made on a valuation basis and as unit values were lower, it is evident that the falling off was less pronounced when referred to quantities. It is worthy of note that competition from foreign chemicals has not abated and in many cases the latter are of the greatest influence in determining values in our markets.

The weighted index number of *Chem. & Met.* gives an average value of 157.85 for April as compared with 160.55 for March and 163.16 for February. In other words, the downward trend of values has not been checked and there was no indication of a change for the better, as the lowest values were current at the end of the month. While foreign made chemicals had some weight in weakening values, the majority of changes originated in purely domestic conditions.

The U. S. Bureau of Labor reports a downward trend for wholesale prices in March and the index number of the bureau for the month, based on 404 commodities or price series, was 150 as against 152 for February. Chemicals and drugs rested at 130 for March and 131 for February. Metals and metal products were represented by 144 and 143 respectively. Comparing prices in March with those of a year ago the bureau places chemicals and drugs at 130 and 135 and metals and metal products at 144 and 149.



Company Reports

Adolph Lewisohn, president, in annual report of Tennessee Copper & Chemical Corporation points out the gratifying increase in earnings during 1923 as result of large demand for sulphuric acid and increasing economies. The fertilizer market during the year did not improve as expected, but demand for sulphuric acid was larger with production of 60 deg. acid for 1923, 299,231 tons, against 218,675 in 1922. This required smelting of larger tonnage of ore. With additional copper derived from the flotation plant, this brought copper output to 12,013,988 lb., compared with 7,553,281 lb. in 1922. Production of silver was 54,564 oz., and of gold 293 oz.

Flotation plant, the large converter and the concentrator recently installed for the production of 66 deg. sulphuric acid have operated efficiently. Demand for 66 deg. acid proved greater than could be supplied by this concentrator, so that a second unit has been added, production from which has just begun.

Improvement in the markets for fertilizers which began last spring unfortunately did not continue. Consumption has been large and satisfactory tonnages have been shipped by the company, but prices have been unduly low, with little or no margin of profit in many instances.

Trade Notes

John D. Wing, for many years connected with Wing & Evans, Inc., has become a general partner of Russell, Miller & Carey, of New York City, members of the New York Stock Exchange. Mr. Wing resigned from Wing & Evans in 1921 after the firm was taken over by the Allied Chemical & Dye Corporation. Wing & Evans was founded by his grandfather and for many years was closely identified with Brumner, Mond & Co., of Northwich, England, and the Solvay Process Co., of Syracuse. Mr. Wing was a director and export manager at the time of his resignation.

A. Wanek, who has been prominent in vegetable oil circles for a number of years, has severed his connection with Elbert & Co., and is now associated with J. P. Grant & Co.

The output of chrome ore from Rhodesian mines in March reached a total of 13,526 tons. During the same period arsenic production was 34 tons.

Judge A. L. Beaty, president of the Texas Co., has been elected a director of the Freeport Texas Co.

Reports from London state that the Swedish Match Co., Stockholm, Sweden, has decided to increase capital to 180,000,000 kroner by issuing 900,000 new shares. Shareholders vote on plan May 5.

Albert B. Silsbee, formerly treasurer of the Ipswich Mills, the Gilmanton Mills and the Cocheco Mfg. Co., died at his home in Boston, Mass., on April 26.

The Hercules Powder Co., Wilmington, Del., is planning to discontinue operations in all branches of its plant at Mount Union, Pa., used extensively during the war, and will dismantle the different structures at an early date. It is said that the equipment will be distributed among the other mills of the company.

The textile committee of the New York Board of Trade and Transportation met last week and decided to approve the proposed formation of a textile group of the Board of Trade, which will devote special attention and study to the textile industry problems.

Market Conditions

New Business in Chemical Products Held to Small Lots

Consuming Requirements Are Largely Covered by Old Contracts—Prices More Stable but Selling Pressure Still Evident

SHIPPING instructions for May deliveries against old contracts have been issued in good volume but buyers have been slow to place orders for additional lots. Most industries have held to the policy of restricting their outputs and are taking less than normal amounts of raw materials. A widening out of business in general is not looked for in the near future and trade authorities predict a continuance of quiet trading until later in the year.

Different private estimates have come out during the week regarding the cotton acreage in Southern states and these estimates place cotton planting at 4 to 6 per cent larger than last year. This has revived hopes of a material gain in consumption of arsenic and calcium arsenate. Neither of these products, however, was in demand during the week and prices were little better than nominal. The late season, undoubtedly, has had much to do with the slow buying of arsenate and it is reasonable to suppose that call for stocks will become more active when weevil damage becomes a factor.

One of the important developments of the period consisted in a report that the Tariff Commission favored an increase of 50 per cent in the duty on nitrite of soda and that the President had asked for a ruling from the Department of Justice on the legality of increasing the duty while the matter was involved because of the lawsuit brought by a prominent importer. The report has caused discussion relative to possible recommendations for tariff changes on other chemicals which have been investigated by the Tariff Commission.

Official figures of chemical exports in March show that branch has held up fairly well. Imports in March fell far below the February totals but arrivals in April have been large and most of the foreign selections are in sufficient supply to hold a competitive place in the local market.

Acids

The recent decline in quotations for acetic acid has placed that commodity on a more attractive basis and more interest has been shown by consumers. There are reports that the market is none too steady at the new level but no further reductions have been announced. Phosphoric acid was lowered in price during the week and 50 per cent acid is now offered at 7c. per lb. in carboys. Some improvement is reported in the demand for citric and tartaric acids but buying suffers in comparison with that of a year ago. It is reported that domestic production of tartaric acid has been materially curtailed this year with some producers relying more on imported offerings. Imports of the latter in March were 303,418 lb., as compared with 100,352 lb. in March 1923. Imported formic acid has been in ample supply and prices have been easy. Oxalic acid imports also were larger in March than a year ago, the figures being 241,857 lb. and 228,025 lb. respectively. Mineral acids are moving in a routine way with prices described as irregular.

Arsenic Lower and Neglected — Formaldehyde Easier — Caustic Potash Steady—Domestic Copper Sulphate Reduced—Decline in Price for Methyl Acetone — Bleaching Powder Offered at Concessions —Phosphoric Acid Lower—Nitrate of Soda Is in Larger Supply—Tin Salts Lower.

Potashes

Bichromate of Potash — The slow position of export trade is shown by the fact that outward shipments in March were but 87,035 lb. as against 1,033,857 lb. in March last year. It is stated that sellers have been offering on a basis of 9¼c. per lb. f.a.s. on inquiries for export. Domestic consumers are not active and call for stocks is spasmodic. Prices are quoted at 9½c. per lb. and upward according to quantity.

Carbonate of Potash—Some sellers say that foreign markets are firmer and that prices on spot will strengthen as stocks are reduced. Calcined 80-85 per cent was quoted at 5½@6c. per lb. and 96-98 per cent at 5¾@6c. per lb., with a difference according to seller. Asking prices on hydrated ranged from 6c. to 6¼c. per lb. Imports have been declining and arrivals from abroad in March were 294,562 lb. in comparison with 1,039,210 lb. in March last year.

Caustic Potash—The supply of imported material has been large enough to take care of all needs but the firm tone which was noted last week has continued and spot prices have been influenced by higher replacement costs. The inside quotation for spot material is 6¾c. per lb. with up to 7c. per lb. asked. Shipments are on a par with spot values. Official figures give imports in March as 1,113,035 lb. as against 832,034 lb. in March last year.

Prussiate of Potash—Red prussiate is said to have sold at 35c. per lb. and is variously quoted from that figure up to 40c. per lb. Yellow prussiate is moving slowly with reports that 18c. per lb. can be done in the spot market. Other sellers ask up to 19c. per lb. for spot goods and 18½@19c. per lb. for shipments.

Sodas

Acetate of Soda—Producers are holding the market for carlots at 5c. per lb. but it is stated that smaller amounts have been offered at the same figure. Demand has not been heavy and surplus stocks are said to have increased in volume.

Bichromate of Soda—Producing costs have been on a steady basis and chrome ore is still quoted at $19.50 per ton for Indian, $21.50 per ton for Rhodesian, and $24 per ton for New Caledonian. Large consumers are well covered ahead and present trading generally is restricted to small lots. Production has been cut down this year and it is reported that one plant will be sold at auction on May 12. Asking prices are holding at 7½@7¾c. per lb. for prompt and nearby deliveries.

Caustic Soda—The export outlook has not been favorable for some time and it has been further complicated by reports that Canada will levy a preferential tariff on shipments into that country on the grounds that domestic producers have been dumping stocks. They base this on reports that sales to Canadian consumers have been made at lower prices than are quoted for American buyers. Exports in March declined sharply, the total being 5,997,383 lb. as compared with 9,855,416 lb. in February. There were offerings last week for export at 2.90c. per lb. f.a.s. A good movement to domestic consumers continues and quotations are unchanged at 3.10c. per lb. for contracts, carlots, at works and 3.20c. per lb. for prompt shipment. Some shading has been reported by dealers but most of the latter say the market is on a firm basis.

Nitrite of Soda—Main interest in this market centers in the probability of an increase in duty on imports. Present duty is 3c. per lb. and the proposed duty under the flexible provisions of the tariff act would be 4½c. per lb. This has caused some discussion regarding its effect on contracts now held by importers. With an increased duty domestic production would, no doubt, increase and would be in a position to

compete for future business. Imports of nitrite in March were 758,433 lb. as against 845,651 lb. in March last year. Quotations have ranged from 8c. to 8½c. per lb.

Prussiate of Soda—Very little call has been noted for this material and both spot and forward positions are dull. Prices have failed to recover from recently reached low levels and spot offerings were available at 10c. per lb. Shipments were nominal in the absence of buying interest. Imports in March were 420,320 lb. as compared with 129,475 lb. in March last year.

Miscellaneous Chemicals

Acetate of Lime—The falling off in consuming demand during the first quarter of the year is shown by the fact that shipments from producing points, which represent approximate consumption, were 26,597,821 lb. as compared with 46,386,951 lb. for the first quarter of 1923. Production in the same periods was 41,700,214 lb. this year and 44,149,936 lb. last year. Naturally stocks on hand represent this condition and at the end of March were 32,370,329 lb. and 12,901,779 lb. at the close of March, 1923. Falling off in exports accounted for a part of the slower movement. Exports for the first quarter of this year were 7,984,108 lb. and in the corresponding period last year 16,571,657 lb. The lower price level reported last week has remained in effect and sellers offer at $3 per 100 lb.

Arsenic—The market for arsenic has been stagnant. Prominent factors say there has been an absence of inquiry which has made quotations little better than nominal. The outlook is regarded with more favor as an increase in cotton acreage is reported and some sellers of arsenic look for brisk buying before the end of the season. The spot market is represented by quotations of 9¾@10c. per lb. Imports in March were large, amounting to 2,181,900 lb. which compares with arrivals of 1,392,289 lb. in March last year.

Acetone—An easy tone has ruled and while some sellers say the quotation for carlots is firm at 15c. per lb. the latter figure is not stimulating buying. Reports are current that competition is keen but these rumors conflict in that some hold producers of acetone are competing keenly and others say that other materials are attracting buyers of acetone.

Bleaching Powder—Exports of bleach in March, while less than in the corresponding period last year, were fairly large. The totals were 1,622,341 lb. in March and 1,962,763 lb. in March last year. Stocks of bleach are reported to be increased and rumors are heard to the effect that some producers are selling through dealers at lower prices than are openly quoted. There has been no change in the open asking price of $1.90 per 100 lb. in carlots at works.

Copper Sulphate—The market for domestic sulphate has been easier and $4.80 per 100 lb. has been openly quoted. Some sellers are said to have quoted this price delivered, consumer's plant. The imported grades are quiet at 4½c. per lb. on spot and shipments could be negotiated as low as 4¼c. per lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	157.02
Last week	156.88
May, 1923	178.00
May, 1922	159.00
May, 1921	143.00
May, 1920	279.00
May, 1919	227.00
May, 1918	267.00

Prices moved within narrow limits. Steadiness in spot linseed oil offset unsettlement in domestic copper sulphate and other miscellaneous items, and the week's index number settled at an advance of 14 points.

Methyl Acetone—A reduction of 5c. per gal. took place during the week, first hands offering supplies on the basis of 80c. per gal., tanks, and 85c. per gal., drums, carloads, prompt shipment from works. Demand has been slow and selling pressure developed.

Formaldehyde — Offerings increased in some quarters and prices were unsettled. As a rule sellers asked 10¾c. per lb., carload lots, but it was reported that smaller parcels changed hands at this figure. Competition for business was keen.

Calcium Chloride — Producers reported a good volume of business and steady prices prevailed in all directions. The selling schedule underwent no change, offerings continuing on the basis of $21 per ton on the fused, in drums, and $27 per ton on the granular, in drums, carload lots, f.o.b. point of production.

Tin Salts—The recent decline in the metal resulted in a moderate downward revision in prices for tin salts. Bichloride was reduced to 13¾c. per lb., and crystals to 35c. per lb.

Ethyl Acetate—Moderate buying developed at the recently lowered price. Producers quote 85 per cent material at 90c. per gal., tanks, and 95c. per gal., drums, carload lots. The 99 per cent grade closed at $1.10 per gal., in drums, carload basis.

Alcohol

Steady undertone featured the market for denatured alcohol, although the volume of new business was not large. Completely denatured, formula No. 5, was offered at 44½c. per gal., in drums, carload basis. Butyl alcohol was available in a fairly large way at 25c. per lb.

Methanol statistics show that production in March amounted to 741,505 gal., compared with 689,028 gal. a year ago, and 689,503 gal. in February. The market was easy in tone, but quotably unchanged. Pure methanol was offered freely at 90c. per gal., tank cars, works.

Coal-Tar Products

Refined Naphthalene Unsettled on Spot; Crude Imports in March Smaller—Phenol Offerings Increase—Benzene Steady

LIBERAL offerings of refined naphthalene were reported on the market and some traders stood ready to name easier prices on round lots for nearby delivery. Demand has not come up to expectations and stocks appear burdensome. Shipments of crude material from abroad have subsided and traders believe that the recent reduction in prices by domestic producers should discourage importers. Statistics on March imports show a falling off in receipts of crude naphthalene. Offerings of U.S.P. phenol have increased and the outlook for the next 3 months favors buyers. Demand for benzene was less active, but as producers in most directions are sold up for the next month or so, prices held on a steady basis. Xylene for nearby delivery was barely steady. Pyridine for shipment from abroad was higher.

Alpha-Naphthylamine—Demand quiet, prices stable at 35@36c. per lb., in bbl.

Benzene—The call for motor grades has not been so active, but with little change in the gasoline situation producers expect prices to hold on a fairly steady basis. Offerings of benzene for June forward delivery were more plentiful. On the 90 per cent grade leading producers again quoted 23c. per gal., tank cars, f.o.b. works. The pure held at 25c. per gal., tank cars. Exports of benzene during March amounted to 6,538,661 lb., which compares with 13,444,274 lb. in March a year ago.

Naphthalene—Supplies of refined are ample for current requirements and, with the demand not up to expectations, the market presents a rather easy undertone. Larger producers have been more aggressive on the selling end. White flake, in carload lots, was offered at 5½c. per lb., with ball at 6½c. per lb. Chips, white, were nominal at 4¾@5c. per lb., carload basis, works. Crude for shipment from abroad settled at 2@2¼c. per lb. Imports of crude in March amounted to 1,084,008 lb., which compares with 2,492,922 lb. in March a year ago. Imports for the 9 months ended March 31, amounted to 12,972,597 lb., compared with 6,706,261 lb. for the corresponding period a year ago.

Phenol—With producers in a position to offer nearby material in a fairly large way, the market has developed further weakness. There were offerings of U.S.P. phenol for immediate shipment at 28c. per lb., in drums, less than carload lots. On round lots for nearby delivery 26c. was asked, with futures nominal at 25@26c.

Pyridine—Higher shipment prices on foreign makes caused prices to steady. On spot material the market advanced to $4.75@$5 per gal. Offerings were scanty.

Xylene — The market was slightly easier, but leading producers continued to quote 40c. on the 5 deg., chemically pure, tank cars, works. The commercial grade of xylene held at 28c. per gal., tank cars, f.o.b. works.

Vegetable Oils and Fats

Refined Cottonseed Oil Lower—Spot Linseed Firm—Olive Foots Easy—Coconut Oil Declines—Tallow in Demand

LIQUIDATION in the option market caused prices for refined cottonseed oil to weaken. Deliveries were larger than predicted. Crude cottonseed underwent little change. Linseed oil for immediate delivery steadied, several crushers having disposed of their May output. China wood oil was irregular, with the undertone firmer just before the close. Sales of coconut oil in bulk went through at slightly lower prices. Olive oil foots on spot was weak on selling pressure. Crude corn oil held steady in the West. Several round lots of tallow sold to soap makers at unchanged prices. Refined rapeseed oil was in demand for shipment from abroad.

Cottonseed Oil—Deliveries of refined oil against May contracts were large enough to weaken prices, notwithstanding the fact that at least one refiner showed willingness to support the market. Tenders amounting to 11,900 bbl. came on the market during the week. Switches were numerous, refiners taking the nearby position and selling the forward months. Some liquidation of July oil made an appearance, moderate selling resulting in transactions in this position as low as 10.15c. per lb. The May option in dealings on the Produce Exchange sold down to 9.82c. on Thursday. December oil was posted at 9c. bid and 9.50c. asked. Crude did not move much one way or the other, but the undertone was easier, 8½c. per lb., tank cars, representing the market in the Valley, and 8⅝c. per lb., tank cars, for oil in the Southeast. The action of pure lard was disappointing, the hog product selling at new lows for the movement. Stocks of lard in the Chicago district on May 1 were placed at 46,364,026 lb., which compares with 33,141,846 lb. on April 1, and 34,212,572 lb. on May 1 a year ago. Lard was offered as low as 11¼c. per lb., while makers of compound continued to quote 11¾c. per lb. carload basis. The more favorable selling basis for lard accounted in part for the quiet prevailing in the compound trade. Demand for cash oil also was inactive.

Corn Oil—Crude oil sold at 9⅛c. per lb., immediate shipment from Chicago, tank car basis. On May shipment 9c. could have been done. The market was steady.

Coconut Oil—Trading developed at slightly lower prices. One lot of approximately 800 tons sold about a week ago at 8¼c. per lb., c.i.f. Norfolk. Late in the past week a bulk lot sold at 7⅞c. per lb., June-July shipment from Manila, c.i.f. San Francisco. Manila oil was offered at 8c. per lb., bulk basis, New York, but failed to attract buyers. The Pacific coast market for domestic Ceylon type oil in tank cars settled at 7⅞@8c. per lb., f.o.b. terms. In New York Ceylon type oil closed at 8½@8⅝c. per lb., f.o.b. terms, nearby and forward positions. Manila copra sold recently at 5¼c. per lb., c.i.f. New York, but bids last week were reduced to 5c.

Linseed Oil—A firmer market prevailed for spot and nearby deliveries. Early in the week round lot business in May shipment oil went through at 88c. per gal., carloads, cooperage basis, but later sellers refused to shade 90c., with several operators firm at 91c. June shipment closed at 89c. per gal., with July at 88c. per gal. July forward was nominal in the absence of buying interest. With an unfavorable market for cake and meal, crushers were not anxious to force sales in futures. On the other hand large consumers expect lower prices for the summer positions, believing that Argentine seed offerings will increase as soon as the domestic crop situation takes more definite form. Reports from the Northwest have been favorable and a substantial increase in acreage is expected. The Duluth seed market held steady on light offerings of old crop seed, the May option on Thursday closing at $2.38⅜ per bu. Buenos Aires quoted May seed at $1.58¼ per bu. There was a fair call for nearby Argentine seed from American crushers. Arrivals of seed from South America have been larger and practically all of the mills around New York are operating at capacity.

Large Exports of Linseed from Argentina

Shipments of linseed from the Argentine from Jan. 1 to April 30, to all countries, amounted to 28,758,000 bu., compared with 26,708,000 bu. for the corresponding period a year ago. The shipments, according to countries, with a comparison, follow:

	1924 Bushels	1923 Bushels
United Kingdom...	3,412,000	2,120,000
Continent..........	11,902,000	8,496,000
United States......	8,700,000	11,708,000
On orders..........	4,744,000	4,384,000
Total..............	28,758,000	26,708,000

China Wood Oil—The market was unsettled. Early in the week offerings of May-June-July came out as low as 12½c. per lb., tank cars, Pacific coast, but before the close sellers raised their views to 12¾@13¼c. per lb. In New York the market settled at 14½@15c. per lb., cooperage basis. There was fair inquiry for immediate shipment oil.

Soya Bean Oil—Business was reported at 9¾c. per lb., May shipment from the Pacific coast, tank cars, duty paid. A report to the effect that production by Dairen mills would be curtailed was not taken seriously by traders here.

Olive Oil Foots—Spot offerings were plentiful and the market was in an unsettled condition as regards prices. During the week offerings came out of ex-dock material as low as 9c. per lb. Spot oil at the close was nominal at 9½c. per lb. Futures commanded a premium.

Palm Oils—No important business was reported. Lagos oil for shipment from Africa held at 7.15@7.20c. per lb., c.i.f. basis. Niger oil was available on same terms at 6.60c. per lb. Lagos on spot held around 7.70c. per lb.

Rapeseed Oil—English refined oil sold in a fairly large way for spring and summer shipment from abroad, lubricating oil manufacturers taking hold. The business went through at less than 80c. per gal. May shipment from abroad was offered at 82@83c. per gal., c.i.f. New York, round lot basis.

Tallow, Etc.—More than 1,000,000 lb. of extra special tallow sold at 7½c. per lb., the price showing no change. The undertone of the market was firm. Demand for choice yellow grease was good and on light offerings the price advanced to 7¼@7½c. per lb., the top figure prevailing for 6 per cent acid material. Oleo stearine sold for export at 10⅞c. per lb., an advance of ⅛c.

Miscellaneous Materials

Antimony — Offerings reported at lower prices, Chinese and Japanese brands closing at 9¼@9½c. per lb. Chinese needle, lump, nominal at 7½@8c. per lb. Standard needle, powdered, 200 mesh, 9@10c. per lb. White oxide, Chinese, 99 per cent, unsettled at 10@10½c. per lb.

Barytes — Withdrawals against old contracts accounted for most of the activity. Prices held steady. Crude offered at $8 per ton, f.o.b. Missouri mines. On the 90@98 per cent Georgia sellers quote $9 per ton. Off color held at $13 per ton, Baltimore, with white at $16 per ton. Water ground, floated, steady at $23@$24 per ton, f.o.b. St. Louis.

Glycerine—Dynamite offered at 16½c. per lb., carload lots, f.o.b. middle western points. Chemically pure barely steady at 16¾@17c. per lb., in drums, carload basis, New York. Crude soap lye, basis 80 per cent, loose, offered at 10⅞c. per lb., f.o.b. point of production. Saponification, basis 88 per cent, loose, nominal at 12c. per lb.

Naval Stores—Spirits of turpentine steady at 91c. per gal., in bbl., New York. Demand has improved. Rosins unsettled on freer offerings and lower grades quoted nominally at $5.60 per bbl.

Quicksilver—Speculative buying was reported late in the week and the market presented a rather firm appearance, with quotations nominal at $77@$79 per flask. Traders believe that the statistical situation is strong and a normal consuming demand should result in even higher prices.

White Lead—The leading interest reduced the price of pig lead to 8c. per lb. to meet outside competition. In the open market sales went through at 7.90c. per lb. The decline in the metal brought out an easier feeling in the market for lead pigments, but up to the close first hands maintained the selling schedule on white lead at 10¼c. per lb. for the dry, in casks, carload lots. Demand for white lead has fallen off in the past month.

Imports at the Port of New York

April 25 to May 1

ACIDS—Citric—200 csk. Palermo, Order. **Cresylic**—66 dr., Liverpool, W. E. Jordan & Bro.; 19 dr., Manchester, Order. **Butyric**—20 demijohns, Hamburg, Order. **Stearic**—20 cs., Rotterdam, M. W. Parsons. **Tartaric**—170 csk., Palermo, Order; 90 bbl., Genoa, Order.

ALCOHOL—240 bbl. denatured, Arecibo, C. Esteva.

AMMONIUM CARBONATE — 10 csk., Liverpool, J. C. Turner & Co.

AMMONIUM CHLORIDE — 76 bbl., Hamburg, Order.

AMMONIUM NITRATE—414 csk., Hamburg, Order.

AMMONIUM PERCHLORATE—363 keg and 22 cs., London, Order.

ANTIMONY OXIDE—250 cs., Shanghai, Wah-Chang Trading Corp.

ANTIMONY REGULUS—400 cs., Hankow, C. Hardy, Inc.; 100 cs., Trieste, Order; 500 cs., Hankow, Order; 500 cs., Shanghai, G. W. Sheldon & Co.

ARSENIC—100 csk., Hamburg, Order.

ASBESTOS — 1,334 bg., Beira, W. D. Crumpton & Co.; 1,000 bg., Capetown, Irving Bank-Col. Trust Co.

BARIUM CARBONATE — 1,000 bg., Hamburg, E. Suter & Co.; 350 bg., Hamburg, Seaboard National Bank.

BARIUM CHLORIDE — 44 csk., Hamburg, Roessler & Hasslacher Chemical Co.

BARYTES — 150 bg., Hamburg, L. A. Salomon & Bros.; 149 bg., Hamburg, A. Klipstein & Co.

BARIUM NITRATE—75 csk., Hamburg, Philadelphia National Bank.

BARIUM BINOXIDE — 31 dr., Havre, Mallinckrodt Chemical Works.

CALCIUM CARBONATE—10 csk., Hamburg, Pfaltz & Bauer.

CALCIUM CHLORIDE—108 dr., Hamburg, E. Suter & Co.

CARBON—441 bg. decolorizing, Rotterdam, L. A. Salomon & Bro.

CASEIN — 201 bg., Bordeaux, Order; 3,502 bg., Buenos Aires, Kalbfleisch Corp.; 408 bg., Buenos Aires, Order; 500 bg., Buenos Aires, Brown Bros. & Co.

CHALK — 200 bg., Antwerp, American Express Co.; 500 bg., Antwerp, L. H. Butcher Co.; 500 bg., Antwerp, Order; 330 bg., Bristol, H. J. Baker & Bros.; 534,000 kilos, Dunkirk, Taintor Trading Co.; 800,000 kilos, Dunkirk, J. W. Higman, Inc.

CHINA CLAY—200 bg., Bristol, J. L. Smith & Co.; 300 bg., Bristol, Bankers Trust Co.; 334 bg., Bristol, C. T. Wilson & Co.; 100 tons, Bristol, L. Knowles; 100 csk., Bristol, Order.

CHEMICALS — 143 csk., Antwerp, Roessler & Hasslacher Chemical Co.; 19 csk., Hamburg, Jungmann & Co.; 372 pkg., Rotterdam, Order; 36 csk., Rotterdam, Order; 40 csk., Rotterdam, Roessler & Hasslacher Chemical Co.; 100 csk., Bordeaux, Order; 3 pkg., Hamburg, Eimer & Amend; 171 pkg., Hamburg, Pfaltz & Bauer; 8 cs., Havre, E. Fougera & Co.; 341 dr. and 17 csk., London, Order; 40 dr., London, J. W. Hampton & Co. 10 bbl., Bremen, Stanley, Daggett, Inc.

CHROME ORE—1 lot (in bulk), Beira, E. J. Lavino & Co.

CITRATE LIME—126 csk., Messina, Order.

COAL-TAR DISTILLATE — 113 dr., Liverpool, Order.

COLORS — 7 cs., Hamburg, American Ambi Corp.; 2 cs. aniline, Hamburg, Franklin Import & Export Co.; 4 csk. do., Hamburg, H. A. Metz & Co.; 3 bbl. do., Genoa, Am. Exchange National Bank; 20 pkg. aniline, Rotterdam, H. A. Metz & Co.; 21 dr., aniline, Liverpool, American Celanese Co.; 6 csk. aniline, Havre, Sandoz Chemical Works; 10 bbl. do., Havre, Order; 4 cs., Havre, Carbic Color & Chemical Co.; 2 csk., Havre, Irving Bank; 9 csk. aniline, Hamburg, Kuttroff, Pickhardt & Co.

CORUNDUM ORE—1,300 bg., Delagoa Bay, Standard Bank of South Africa; 790 bg., Delagoa Bay, Order.

COPPER SULPHATE — 250 csk., Hamburg, Order; 100 bbl., Hamburg, Philipp Bros.

CUTCH—1,000 bg., Singapore, Order.

DIVI-DIVI—2,000 bg., Curacao, Selma Mercantile Corp.

EPSOM SALT — 246 bbl., Hamburg, Roessler & Hasslacher Chem. Co.; 500 bg., Hamburg, Order; 500 bg. Hamburg, Innis, Speiden & Co.

FERROCHROME — 23 csk., Hamburg, Order.

FUSEL OIL—7 bbl., Antwerp, Order.

GALLNUTS—500 cs., Hankow, Mallinckrodt Chemical Works; 250 cs., Hankow, Zinnser & Co.

GAMBIER — 246 cs., Singapore, New York Trust Co.

GLYCERINE—120 dr., crude, Marseilles, Order; 50 dr., Marseilles, Order.

GUMS—100 cs. damar, Batavia, Chemical National Bank; 100 cs. do., Batavia, Bank of the Manhattan Co.; 200 cs. do., Batavia, Innes & Co.; 100 cs. do., Batavia, A. Klipstein & Co.; 150 cs. do., Batavia, France, Campbell & Darling; 305 cs. do., Singapore, Baring Bros. & Co.; 50 cs. do., Singapore, Brown Bros. & Co.; 150 cs. do., Singapore, Order; 751 bg. copal, Matadi, L. C. Gillespie & Sons; 100 cs. copal, Singapore, L. C. Gillespie & Sons; 50 cs. damar, Singapore, C. F. Smillie & Co.; 249 bg. damar, Singapore, Order; 67 bg. damar, London, Baring Bros. & Co.; 1,000 cs. damar, Batavia, Order; 880 bskt. and 147 bg. copal, Macassar, Innes & Co.; 483 bskt. and 908 bg. copal, Macassar, L. C. Gillespie & Sons; 524 bskt. copal, Macassar, S. Winterbourne & Co.; 1,158 pkg. do., Macassar, Order; 32 bg. copal, London, Innes & Co.; 2,766 bg. arabic, Port Sudan, Order; 210 bg. damar, Singapore, Chemical Natl. Bank; 1,203 pkg. damar and 483 pkg. copal, Singapore, Order.

IRON CHLORIDE—48 csk., Hamburg, C. Hardy, Inc.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

BICHROMATE OF SODA AND POTASH, and other heavy chemicals. Bombay, India. Agency.—9979.

CELLULOSE, ACETATE. Rotterdam, Netherlands. Agency.—99.78.

CHEMICALS. Lausanne, Switzerland. Agency.—9963.

CHEMICALS, heavy. Hamburg, Germany. Purchase and agency.—9984.

CHEMICALS, heavy (fertilizers). Cape Town, South Africa. Agency.—9988.

COAL-TAR AND GLUE. Weltevreden, Java. Agency.—9981.

INSECTICIDES, cattle and sheep dips, and fungicides. Cape Town, South Africa. Agency.—9988.

PAINTS AND VARNISHES. Weltevreden, Java. Agency.—9981.

PHOSPHOROUS MATCHES. Caen, France. Agency.—9977.

ROSIN, etc. Hamburg, Germany. Purchase and agency.—9984.

ROSIN, 60 carloads of 10 tons each. Vienna, Austria. Purchase.—9983.

ROSIN, 5 to 10 tons monthly. Breslau, Germany. Purchase.—9985.

SALTPETER AND SULPHUR. Weltevreden, Java. Agency.—9981.

SOAP manufacturing, oils and chemicals for. Stavanger, Norway. Agency. 9976.

SULPHATE OF COPPER AND IRON. Weltevreden, Java. Agency.—9981.

TURPENTINE. Hamburg, Germany. Purchase and agency.—9984.

TURPENTINE. Holyhead, Wales. Purchase.—9989.

IRON OXIDE — 35 csk., Hull, J. Lee Smith & Co.; 76 csk., Bristol, W. Schall & Co.; 34 csk., Bristol, Reichard-Coulston, Inc.; 23 csk., Liverpool, L. H. Butcher & Co.; 5 csk., Liverpool, J. Lee Smith & Co.; 10 csk., & 10 keg, Liverpool, J. H. Rhodes & Co.; 5 csk., Liverpool, C. B. Chrystal Co.; 10 csk., Liverpool, Order.

IRON POWDER — 5 cs., Hamburg, American Ferro Corp.

LOGWOOD EXTRACT—10 bbl., Monte Cristy, T. S. Todd & Co.

LITHOPONE — 4 csk., Rotterdam, Reichard-Coulston, Inc.

MAGNESIUM CHLORIDE — 368 dr., Hamburg, Innis, Speiden & Co.; 46 bbl., Hamburg, Order; 150 dr., Hamburg, Diener, Blank & Co.; 174 dr., Hamburg, C. Hardy, Inc.; 247 csk., Hamburg, American Commerce & Finance Co.

MANGROVE BARK—1,332 bg., Beira, Order; 500 bg., Singapore, Order; 10 bg., Macassar, Sino Java H'v'g.; 4,500 bg., Singapore, Order.

MAGNESITE — 313 bg., Rotterdam, Speiden, Whitfield Co.

MINERAL WHITE—480 bg., Liverpool, Hammill & Gillespie.

MYROBALANS—4,112 pkts., Calcutta, National City Bank; 2,062 pkts., Calcutta, Order; 600 bg., Calcutta, Order.

OILS—Cod—200 bbl., Hull, Order; 55 csk., St. Johns, R. Badcock & Co. **Castor**—145 bbl., Antwerp, Order. **China Wood**—1,000 bbl., Hankow, Order. **Coconut**—820 tons (in bulk), Manila, Order; 770 tons (in bulk), Manila, Spencer Kellogg & Sons. **Linseed**—9 bg. oxidized, Hull, Lincrusta Walton Co.; 11 csk., Hull, Nairn Linoleum Co.; 145 bbl., Hull, Order; 29 bbl., London, Intl. Composition Co. **Olive Foots** (sulphur oil)—130 bbl., Naples, Banca Comm. Ital; 200 bbl., Naples, National City Bank; 400 bbl., Leghorn, Order; 200 bbl., Palermo, Order. **Palm**—807 csk., Matadi, Niger Co.; 336 csk., Cotonou, F. & A. Swanzy; 555 csk., Abanome, Irving Bank; 39 csk., Abanome, African & Eastern Trading Co.; 78 csk., Lagos, African & Eastern Trading Co.; 100 bbl., Liverpool, Order. **Rapeseed**—150 bbl., Hull, Balfour, Williamson & Co.; 700 bbl., Hull, Vacuum Oil Co.; 915 bbl., Hull, Order. **Sesame**—50 bbl., Rotterdam, Welch, Holme & Clark Co.

OIL SEEDS—Castor—50 bg., Rio de Janeiro, M. H. Grace Co., Inc. **Linseed**—61,488 bg., Rosario, Order; 19,301 bg., Buenos Aires, Order; 69,599; bg., Buenos Aires, Bunge North Am. Grain Corp.; 10,500 bg., Buenos Aires, National City Bank; 21,242 bg., Buenos Aires, Order; 34,447 bg., Rosario, Order; 8,266 bg., Buenos Aires, Order. **Peanuts**—700 bg. shelled, Semarang, Order; 454 bg. do., Cheribon, Order.

PHOSPHORUS — 75 bbl., Hamburg, Roessler & Hasslacher Chem. Co.

PITCH—90 bbl., cottonseed oil, Manchester, Order.

POTASSIUM SALTS — 120 csk. alum, Antwerp, Order; 17 bbl. alum, Hamburg, Hans Hinrichs Chemical Co.; 465 dr. caustic, Hamburg, T. Goldschmidt Corp.; 50 csk. alum, Hamburg, A. Klipstein & Co.; 100 csk. do., Hamburg, Cooper & Cooper; 100 bbl. chlorate, Hamburg, Order; 100 csk. alum, Hamburg, Order; 247 csk. caustic, Hamburg, Roessler & Hasslacher Chemical Co.; 4 csk. prussiate, London, H. Kohnstamm & Co.; 2,500 bg. muriate and 1 lot manure salt, Hamburg, Potash Importing Corp. of America; 1,100 csk. chlorate, Hamburg, Seaboard Natl. Bank.

PLUMBAGO—200 bbl., Colombo, Irving Bank-Col. Trust Co.; 180 bbl., Colombo, N. Y. Trust Co.; 286 bg., Colombo, Brown Bros. & Co.; 171 bg. and 150 bbl., Colombo, H. W. Peabody & Co.; 342 pkg., Colombo, Order.

QUEBRACHO—8,494 bg., Buenos Aires, First National Bank of Boston; 11,823 bg., Buenos Aires, International Products Co.; 1,980 bg., Buenos Aires, J. C. Andreson & Co.; 966 bg., Buenos Aires, Barth Leather Co.; 5,598 bg., Buenos Aires, Order.

(*Continued on page 734*)

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

General Chemicals

Acetone, drums, wks.	lb.	$0.15 -	$0.15½
Acetic anhydride, 85%, dr.	lb.	.38 -	....
Acid, acetic, 28%, bbl.	100 lb.	3.12 -	3.37
Acetic, 56%, bbl.	100 lb.	5.85 -	6.10
Acetic, 80%, bbl.	100 lb.	8.19 -	8.44
Glacial, 99½%, bbl.	100 lb.	11.01 -	11.51
Boric, bbl.	lb.	.10 -	...
Citric, kegs	lb.	.45½ -	.47
Formic, 85%	lb.	.12½ -	.13
Gallic, tech.	lb.	.45 -	.50
Hydrofluoric, 52%, carboys	lb.	.11 -	.12
Lactic, 44%, tech., light, bbl.	lb.	.12½ -	.13
22% tech., light, bbl.	lb.	.06 -	.06½
Muriatic, 18° tanks	100 lb.	.80 -	.85
Muriatic, 20°, tanks	100 lb.	.95 -	1.00
Nitric, 36°, carboys	lb.	.04 -	.04½
Nitric 42°, carboys	lb.	.04¾ -	.05¼
Oleum, 20%, tanks	ton	16.00 -	17.00
Oxalic, crystals, bbl.	lb.	.10½ -	.10¾
Phosphoric, 50% carboys	lb.	.07 -	.08
Pyrogallic, resublimed	lb.	1.55 -	1.60
Sulphuric, 60°, tanks	ton	9.00 -	10.00
Sulphuric, 60°, drums	ton	13.00 -	14.00
Sulphuric, 66°, tanks	ton	14.00 -	15.00
Sulphuric, 66° drums	ton	19.00 -	20.00
Tannic, U.S.P., bbl.	lb.	.65 -	.70
Tannic, tech., bbl.	lb.	.45 -	.50
Tartaric, imp., powd., bbl.	lb.	.27 -	.28
Tartaric, domestic, bbl.	lb.	.30 -	...
Tungstic, per lb.	lb.	1.20 -	1.25
Alcohol, butyl, drums, f.o.b. works	lb.	.25 -	.30
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.85 -	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.81 -	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.51½ -	...
No. 1, 190 proof, special, dr.	gal.	.45½ -	...
No. 1, 188 proof, bbl.	gal.	.52½ -	...
No. 1, 188 proof, dr.	gal.	.48½ -	...
No. 5, 188 proof, bbl.	gal.	.50½ -	...
No. 5, 188 proof, dr.	gal.	.44½ -	...
Alum, ammonia, lump, bbl.	lb.	.03½ -	.04
Potash, lump, bbl.	lb.	.03 -	.04
Chrome, lump, potash, bbl.	lb.	.05½ -	.06
Aluminum sulphate, com., bags	100 lb.	1.40 -	1.50
Iron free bags	lb.	2.40 -	2.50
Aqua ammonia, 26°, drums	lb.	.06½ -	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 -	.30
Ammonium carbonate, powd. tech., casks	lb.	.12 -	.13
Ammonium nitrate, tech., casks	lb.	.09 -	.10
Amyl acetate tech., drums	gal.	3.25 -	3.75
Antimony oxide, white, bbl.	lb.	.09½ -	.10
Arsenic, white, powd., bbl.	lb.	.09½ -	.10½
Arsenic, red, powd., kegs	lb.	.14½ -	.15½
Barium carbonate, bbl.	ton	64.00 -	68.00
Barium chloride, bbl.	ton	88.00 -	90.00
Barium dioxide, 88%, drums	lb.	.17½ -	.18
Barium nitrate, casks	...	.07½ -	.08½
Blanc fixe, dry, bbl.	lb.	.03¾ -	.04
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 -	....
Spot N. Y. drums	100 lb.	2.25 -	2.35
Borax, bbl.	lb.	.05½ -	.05¾
Bromine, cases	lb.	.28 -	.30
Calcium acetate, bags	100 lb.	3.00 -	3.05
Calcium arsenate, dr.	lb.	.11 -	.11½
Calcium carbide, drums	lb.	.05 -	.05¾
Calcium chloride, fused, dr. wks.	ton	21.00 -	....
Gran. drums works	ton	27.00 -	....
Calcium phosphate, mono, bbl.	lb.	.06½ -	.07½
Camphor, Jap. cases	lb.	.75 -	.76
Carbon bisulphide, drums	lb.	.06 -	.06½
Carbon tetrachloride, drums	lb.	.07½ -	.08
Chalk, precip.—domestic, light, bbl.	lb.	.04½ -	.04½
Domestic, heavy, bbl.	lb.	.03½ -	.04
Imported, light, bbl.	lb.	.04½ -	.05
Chlorine, liquid, tanks, wks.	lb.	.04½ -	....
Contract, tanks, wks.	lb.	.04½ -	....
Cylinders, 100 lb., wks.	lb.	.05½ -	.07½
Chloroform, tech., drums	lb.	.30 -	.32
Cobalt, oxide, bbl.	lb.	2.10 -	2.25
Copperas, bulk, f.o.b. wks.	ton	16.00 -	18.00
Copper carbonate, bbl.	lb.	.16½ -	.17
Copper cyanide, drums	lb.	.45 -	.46
Coppersulphate, dom., bbl.	100 lb.	4.80 -	4.90
Imp bbl.	100 lb.	4.50 -	4.60
Cream of tartar, bbl.	lb.	.20½ -	.21½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 -	2.00
Epsom salt, imp., tech., bags	100 lb.	1.10 -	1.20
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 -	2.50
Ether, U.S.P., dr.	lb.	.14 -	.15
Ethyl acetate, 85%, drums	gal.	.95 -	....

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

Ethyl acetate, 99%, dr.	gal.	$1.10 -	....
Formaldehyde, 40%, bbl.	lb.	.10¾ -	.11
Fullers earth—f..o.b. mines	ton	7.50 -	18.00
Furfural, works, bbl.	lb.	.25 -	....
Fusel oil, ref., drums	gal.	3.50 -	....
Fusel oil, crude, drums	gal.	2.50 -	2.75
Glaubers salt, wks., bags	100 lb.	1.20 -	1.40
Glaubers salt, imp., bags	100 lb.	1.00 -	1.05
Glycerine, c.p., drums extra	lb.	.16¾ -	.17
Glycerine, dynamite, drums	lb.	.16¼ -	.16½
Glycerine, crude 80%, loose	lb.	.10¾ -	.11
Hexamethylene, drums	lb.	.68 -	.75
Lead:			
White, basic carbonate, dry, casks	lb.	.10¼ -	....
White, basic sulphate, casks	lb.	.09¾ -	....
White, in oil, kegs	lb.	.12¾ -	....
Red, dry, casks	lb.	.12 -	....
Red, in oil, kegs	lb.	.13¼ -	....
Lead acetate, white crys., bbl.	lb.	.14½ -	....
Brown, broken, casks	lb.	.13½ -	....
Lead arsenate, powd., bbl.	lb.	.18 -	.20
Lime-Hydrated, bg, wks.	ton	10.50 -	12.50
Bbl., wks.	ton	18.00 -	19.00
Lime, Lump, bbl.	280 lb.	3.63 -	3.65
Litharge, comm., casks	lb.	.11½ -	....
Lithopone, bags	lb.	.06¼ -	.06½
Magnesium carb., tech., bags	lb.	.08½ -	.08½
Methanol, 95%, bbl.	gal.	.93 -	....
Methanol, 97%, bbl.	gal.	.95 -	....
Methanol, pure, tanks	gal.	.90 -	....
drums	gal.	1.00 -	....
bbl	gal.	1.05 -	....
Methyl-acetone, t'ks	gal.	.80 -	....
Nickel salt, double, bbl.	lb.	.09½ -	.10½
Nickel salts, single, bbl.	lb.	.10½ -	.11
Orange mineral, csk.	lb.	.14½ -	.15½
Phosgene	....	.60 -	.75
Phosphorus, red, cases	lb.	.70 -	.75
Phosphorus, yellow, cases	lb.	.35 -	.40
Potassium bichromate, casks	lb.	.09½ -	.09¾
Potassium bromide, gran., bbl.	lb.	.19 -	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.05½ -	.06
Potassium chlorate, powd.	lb.	.07½ -	.08½
Potassium cyanide, drums	lb.	.47 -	.52
Potassium, first sorts, cask	lb.	.07½ -	.08
Potassium hydroxide (caustic potash) drums	lb.	.06¾ -	.07
Potassium iodide, cases	lb.	3.65 -	3.75
Potassium nitrate, bbl.	lb.	.07½ -	.09
Potassium permanganate, drums	lb.	.14 -	.14½
Potassium prussiate, red, casks	lb.	.36 -	.40
Potassium prussiate, yellow, casks	lb.	.18 -	.18½
Salammoniac, white, gran., casks, imported	lb.	.06¾ -	....
Salammoniac, white, gran., bbl., domestic	lb.	.07½ -	.07¾
Gray, gran., casks	lb.	.08 -	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk) works	ton	23.00 -	....
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 -	....
bags, contract	100 lb.	1.38 -	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 -	....
bags, contract	100 lb.	1.45 -	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 -	....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 -	3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	3.00 -	....
Sodium acetate, works, bbl.	lb.	.05 -	.05½
Sodium bicarbonate, bulk	100 lb.	1.75 -	....
330-lb. bbl.	100 lb.	2.00 -	....
Sodium bichromate, casks	lb.	.07½ -	.07¾
Sodium bisulphate (niter cake)	ton	6.00 -	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ -	.04½
Sodium chlorate, kegs	lb.	.06½ -	.07
Sodium chloride long	ton	12.00 -	13.00
Sodium cyanide, cases	lb.	.19 -	.22

Sodium fluoride, bbl.	lb.	$0.08¾ -	$0.10
Sodium hyposulphite, bbl.	lb.	.02½ -	.02¾
Sodium nitrite, casks	lb.	.08¼ -	.08½
Sodium peroxide, powd., cases	lb.	.28 -	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½ -	.03¾
Sodium prussiate, yel. bbl.	lb.	.10 -	.12
Sodium salicylic, drums	lb.	.38 -	.40
Sodium silicate (40°, drums)	100 lb.	.75 -	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 -	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03¼ -	.03½
Sodium sulphite, crys., bbl.	lb.	.03½ -	.03¾
Strontium nitrate, powd., bbl.	lb.	.10 -	.10½
Sulphur chloride, yel drums.	lb.	.04½ -	.05
Sulphur, crude	ton	18.00 -	20.00
At mine, bulk	ton	16.00 -	18.00
Sulphur, flour, bag	100 lb.	2.25 -	2.35
Sulphur, roll, bag	100 lb.	2.00 -	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 -	.08
Tin bichloride, bbl.	lb.	.13¾ -	.....
Tin oxide, bbl.	lb.	.53 -	.55
Tin crystals, bbl.	lb.	.35 -	.....
Zinc carbonate, bags	lb.	.14 -	.14½
Zinc chloride, gran, bbl.	lb.	.05 -	.05½
Zinc cyanide, drums	lb.	.36½ -	.37
Zinc dust, bbl	lb.	.08 -	.08½
Zinc oxide, lead free, bag	lb.	.07¾ -	.....
5% lead sulphate, bags	lb.	.07¾ -	.....
10 to 35 % lead sulphate, bags	lb.	.07 -	.....
French, red seal, bags	lb.	.09¾ -	.....
French, green seal, bags	lb.	.10¾ -	.....
French, white seal, bbl	lb.	.12 -	.....
Zincsulphate, bbl.	100 lb.	3.00 -	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 -	$0.65
Alpha-naphthol, ref., bbl.	lb.	.70 -	.75
Alpha-naphthylamine, bbl.	lb.	.35 -	36
Aniline oil, drums	lb.	.16 -	.16½
Aniline salts, bbl.	lb.	.22 -	.23
Anthracene, 80%, drums	lb.	.75 -	.80
Anthraquinone, 25%, paste, drums	lb.	.75 -	.80
Benzaldehyde U.S.P., carboys	lb.	1.50 -	.....
f.f.c. drums	lb.	1.60 -	.....
tech, drums	lb.	68	.72
Benzene, pure, water-white, tanks, works	gal.	.25 -	....
Benzene, 90%, tanks, works	gal.	.23 -	....
Benzidine base, bbl.	lb.	.80 -	.82
Benzidine sulphate, bbl.	lb.	.70 -	.72
Benzoic acid, U.S.P., kegs	lb.	.82 -	85
Benzoate of soda, U.S.P., bbl.	lb.	.67 -	.72
Benzyl chloride, 95-97%, ref., carboys	lb.	.35 -	....
Benzyl chloride, tech., drums	lb.	.25 -	....
Beta-naphthol, tech., bbl.	lb.	.24 -	.25
Beta-naphthylamine, tech.	lb.	.65 -	.70
Cresol, U.S.P., drums	lb.	.23 -	.28
Ortho-cresol, drums	lb.	.28 -	.32
Cresylic acid, 97%, works drums	gal.	.65 -	.70
95-97%, drums, works	gal.	.60 -	.65
Dichlorbenzene, drums	lb.	.07 -	.08
Diethylaniline, drums	lb.	.53 -	.55
Dimethylaniline, drums	lb.	.36 -	.38
Dinitrobenzene, bbl.	lb.	.16 -	.18
Dinitrochlorbenzene, bbl.	lb.	.21 -	.22
Dinitronaphthalen, bbl.	lb.	.30 -	.32
Dinitrophenol, bbl.	lb.	.35 -	.40
Dinitrotoluen, bbl.	lb.	.18 -	.20
Dip oil, 25%, drums	gal.	.26 -	.28
Diphenylamine, bbl.	lb.	.50 -	.52
H-acid, bbl.	lb.	.72 -	.75
Meta-phenylenediamine, bbl.	lb.	.95 -	1.00
Michlers ketone, bbl.	lb.	3.00 -	3.50
Monochlorbenzene, drums	lb.	.08 -	.10
Monoethylaniline, drums	lb.	.95 -	1.10
Naphthalene, flake, bbl.	lb.	.05½ -	.06
Naphthalene, balls, bbl.	lb.	.06½ -	.07
Naphthionate of soda, bbl.	lb.	.60 -	.65
Naphthionic acid, crude, bbl.	lb.	.60 -	.62
Nitrobenzene, drums	lb.	.09 -	.09½
Nitro-naphthalene, bbl.	lb.	.25 -	.30
Nitro-toluene, drums	lb.	.13½ -	.14
N-W acid, bbl.	lb.	1.05 -	1.10
Ortho-amidophenol, kegs	lb.	2.40 -	2.50
Ortho-dichlorbenzene, drums	lb.	.12 -	.13
Ortho-nitrophenol, bbl.	lb.	1.25 -	1.30
Ortho-nitrotoluene, drums	lb.	.11 -	.12
Ortho-toluidine, bbl.	lb.	.12 -	.13
Para-aminophenol, base, kegs	lb.	1.25 -	1.35
Para-aminophenol, HCl, kegs	lb.	1.45 -	1.60
Para-dichlorbenzene, bbl.	lb.	.17 -	.20
Paranitraniline, bbl.	lb.	.68 -	.70
Para-nitrotoluene, bbl.	lb.	.58 -	.60
Para-phenylenediamine, bbl.	lb.	1.40 -	1.50
Para-toluidine, bbl	lb.	.72 -	.80
Phthalic anhydride, bbl.	lb.	.30 -	.34
Phenol, U.S.P., dr.	lb.	.26 -	.28
Picric acid, bbl.	lb.	.20 -	.22
Pitch, tanks, works	ton	25.00 -	30.00
Pyridine, imp., drums	gal.	4.75 -	5.00
Resorcinol, tech., kegs	lb.	1.30 -	1.40

Resorcinol, pure, kegs	lb.	$2.05 –	$2.10
R-salt, bbl	lb.	.55 –	.60
Salicylic acid, tech., bbl	lb.	.32 –	.33
Salicylic acid, U.S.P., bbl	lb.	.35 –	....
Solvent naphtha, water-white, tanks	gal.	.25 –	....
Crude, tanks	gal.	.22 –	....
Sulphanilic acid, crude, bbl	lb.	.16 –	.18
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.26 –	....
Toluene, drums, works	gal.	.30 –	....
Xylidine, drums	lb.	.48 –	.50
Xylene, pure, tanks	gal.	.40 –	....
Xylene, com., tanks	gal.	.28 –	....

Naval Stores

Rosin B-D, bbl	280 lb.	$5.60 –	$5.70
Rosin E-I, bbl	280 lb.	5.75 –	....
Rosin K-N, bbl	280 lb.	5.90 –	6.10
Rosin W.G.-W.W., bbl	280 lb.	7.00 –	7.60
Wood rosin, bbl	280 lb.	5.80 –	5.90
Turpentine, spirits of, bbl	gal.	.90 –	.91
Wood, steam dist., bbl	gal.	.85 –	....
Wood, dest. dist., bbl	gal.	.67 –	....
Pine tar pitch, bbl	200 lb.	5.50 –	....
Tar, kiln burned, bbl	500 lb.	11.00 –	....
Retort tar, bbl	500 lb.	11.00 –	....
Rosin oil, first run, bbl	gal.	.41 –	....
Rosin oil, second run, bbl	gal.	.45 –	....
Rosin oil, third run, bbl	gal.	.47 –	....
Pine oil, steam dist.	gal.	.65 –	....
Pine tar oil, ref.	gal.	.50 –	....

Animal Oils and Fats

Degras, bbl	lb.	$0.03½ –	$0.05½
Grease, yellow, loose	lb.	.07½ –	.07¾
Lard oil, Extra No. 1, bbl	gal.	.85 –	....
Lard compound, bbl	lb.	.11½ –	.12
Neatsfoot oil 20 deg. bbl	gal.	1.28 –	....
No. 1, bbl	gal.	.88 –	.92
Oleo Stearine		.10½ –	....
Oleo oil, No. 1, bbl	lb.	.12½ –	.12¾
Red oil, distilled, d.p. bbl	lb.	.08½ –	.09¼
Saponified, bbl	lb.	.08½ –	.09¼
Tallow, extra, loose	lb.	.07½ –	....
Tallow oil, acidless, bbl	gal.	.83 –	....

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.15½ –	....
Castor oil, No. 1, bbl	lb.	.16 –	....
Chinawood oil, bbl	lb.	.14½ –	.15
Coconut oil, Ceylon, bbl	lb.	.09½ –	....
Ceylon, tanks, N.Y.	lb.	.08½ –	....
Coconut oil, Cochin, bbl	lb.	.09½ –	.10
Corn oil, crude, bbl	lb.	.10½ –	.11½
Crude, tanks, (f.o.b. mill)	lb.	.09½ –	....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08¼ –	.08½
Summer yellow, bbl	lb.	.10¼ –	.10½
Winter yellow, bbl	lb.	.11½ –	.11¾
Linseed oil, raw, car lots, bbl.	gal.	.90 –	....
Raw, tank cars (dom.)	gal.	.84 –	....
Boiled, cars, bbl. (dom.)	gal.	.92 –	....
Olive oil, denatured, bbl	gal.	1.25 –	1.30
Sulphur, (foots) bbl	lb.	.09½ –	.09¾
Palm, Lagos, casks	lb.	.07½ –	.07½
Niger, casks	lb.	.06½ –	....
Palm kernel, bbl	lb.	.08½ –	.08¾
Peanut oil, crude, tanks (mill)	lb.	.11½ –	....
Peanut oil, refined, bbl	lb.	.14½ –	.15
Perilla, bbl	lb.	.14 –	.14½
Rapeseed oil, refined, bbl	gal.	.90 –	.92
Sesame, bbl	lb.	.11½ –	.11½
Soya bean (Manchurian), bbl.	lb.	.11½ –	....
Tank, f.o.b. Pacific coast	lb.	.09½ –	.10
Tank, (f.o.b. N.Y.)	lb.	.10½ –	....

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.62 –	$0.65
Menhaden, light pressed, bbl.	gal.	.60 –	....
White bleached, bbl	gal.	.62 –	....
Blown, bbl	gal.	.66 –	....
Crude, tanks (f.o.b. factory)	gal.	.50 –	....
Whale No. 1 crude, tanks, coast	lb.	.... –	....
Winter, natural, bbl	gal.	.75 –	.76
Winter, bleached, bbl	gal.	.78 –	.79

Oil Cake and Meal

Coconut cake, bags	ton	$30.00 –	....
Cottonseed meal, f.o.b. mills	ton	38.00 –	....
Linseed cake, bags	ton	34.00 –	35.00
Linseed meal, bags	ton	40.00 –	42.00

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.50 –	$0.55
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochneal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04½ –	.04¾
Cutch, Rangoon, bales	lb.	.13½ –	.14½
Dextrine, corn, bags	100 lb.	3.74 –	3.94
Dextrine, gum, bags	100 lb.	4.09 –	4.19
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	.10½ –	.11½
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	.... –	....
Sumac, ground, bags	ton	150.00 –	160.00
Sumac, domestic, bags	ton	50.00 –	55.00
Starch, corn, bags	100 lb.	3.12 –	3.22
Tapioca flour, bags	lb.	.05¾ –	.06½

Extracts

Archil, conc., bbl	lb.	$0.16½ –	$0.20
Chestnut, 25% tannin, tanks	lb.	.01¾ –	.02¾
Divi-divi, 25% tannin, bbl	lb.	.04 –	.05
Fustic, crystals, bbl	lb.	.20 –	.22
Fustic, liquid, 42°, bbl	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.09½ –	.10
Hematine crys., bbl	lb.	.14 –	.18
Hemlock, 25% tannin, bbl	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl	lb.	.09½ –	.10½
Logwood, crys., bbl	lb.	.14 –	.15
Logwood, liq., 51°, bbl	lb.	.08 –	.09
Osage Orange, 51°, liquid, bbl.	lb.	.07 –	.08
Osage Orange, powder, bg	lb.	.14 –	.15
Quebracho, solid, 65% tannin, bbl	lb.	.05 –	.05½
Sumac, dom., 51°, bbl	lb.	.07 –	.07½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, contract	lb.	$0.09 –	$0.11
spot, cases	lb.	.12 –	.16
Lampblack, bbl	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl	lb.	.38 –	.42
Prussian, bbl	lb.	.38 –	.42
Ultramarine, bbl	lb.	.08 –	.35
Browns, Sienna, Ital., bbl	lb.	.06 –	.14
Sienna, Domestic, bbl	lb.	.03½ –	.04
Umber, Turkey, bbl	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl	lb.	.28 –	.30
Chrome, commercial, bbl	lb.	.12 –	.12½
Paris, bulk	lb.	.26 –	.27
Reds Carmine No. 40, tins	lb.	4.50 –	4.70
Iron oxide red, casks	lb.	.10 –	.16
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl	lb.	1.35 –	1.40
Yellow, Chrome, C.P. bbls	lb.	.16½ –	.17
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl	lb.	$0.20 –	$0.21
Beeswax, crude, Afr. bg	lb.	.25 –	.26
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.23 –	.23½
Carnauba, No. 1, bags	lb.	.38 –	.39
No. 2, North Country, bags	lb.	.28½ –	.29
No. 3, North Country, bags	lb.	.20 –	.21
Japan, cases	lb.	.25 –	.26
Montan, crude, bags	lb.	.05½ –	.06
Paraffine, crude, match, 105-110 m.p., bbl	lb.	.05¾ –	....
Crude, scale 124-126 m.p. bags	lb.	.05½ –	....
Ref., 118-120 m.p., bags	lb.	.05½ –	....
Ref., 123-125 m.p., bags	lb.	.05½ –	....
Ref, 128-130 m.p., bags	lb.	.05¾ –	....
Ref., 133-135 m.p., bags	lb.	.06 –	....
Ref., 135-137 m.p., bags	lb.	.06¼ –	.06½
Stearic acid, sgle pressed, bags	lb.	.11 –	.11½
Double pressed, bags	lb.	.11½ –	.11¾
Triple pressed, bags	lb.	.13 –	.13½

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$7.50 –	$7.75
Ammonium sulphate, bulk f.o.b. works	100 lb.	2.70 –	2.75
Blood, dried, bulk	unit	4.10 –	4.15
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	.... –	....
Nitrate of soda, bags	100 lb.	2.50 –	....
Tankage, high grade, f.o.b. Chicago	unit	2.00 –	2.10
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.40 –	....
Tennessee, 75%	ton	6.75 –	7.00
Potassium muriate, 80%, bags	ton	34.55 –	....
Potassium sulphate, bags basis 90%	ton	45.85 –	....
Double manure salt	ton	26.35 –	....
Kainit	ton	7.22 –	....

Crude Rubber

Para—Upriver fine	lb.	$0.20½ –	....
Upriver coarse	lb.	.16½ –	....
Upriver caucho ball	lb.	.18 –	....
Plantation—First latex crepe	lb.	.23 –	....
Ribbed smoked sheets	lb.	.22½ –	....
Amber crepe No. 1	lb.	.22½ –	....

Gums

Copal, Congo, amber, bags	lb.	$0.10 –	$0.15
East Indian, bold, bags	lb.	.20 –	.21
Manila, pale, bags	lb.	.19 –	.20
Pontinak, No. 1 bags	lb.	.19 –	.20
Damar, Batavia, cases	lb.	.23½ –	.24
Singapore, No. 1, cases	lb.	.31 –	.32
Singapore, No. 2, cases	lb.	.21½ –	.22
Kauri, No. 1, cases	lb	.62 –	.64
Ordinary chips, cases	lb.	.20½ –	.21½
Manjak, Barbados, bags	lb.	.08 –	.11

Shellac

Shellac, orange fine, bags	lb.	$0.57 –	....
Orange superfine, bags	lb.	.59 –	....
A. C. garnet, bags	lb.	.53 –	$0.54
Bleached, bonedry	lb.	.65 –	....
Bleached, fresh	lb.	.54 –	.55
T. N., bags	lb.	.55 –	....

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$300.00 –	$400.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	50.00 –	70.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl	net ton	16.00 –	17.00
Barytes, grd., off-color, f.o.b. Balt.	net ton	13.00 –	14.00
Barytes, floated, f.o.b. St. Louis, bbl	net ton	23.00 –	24.00
Barytes, crude f.o.b. mines, bulk	net ton	8.00 –	8.50
Casein, bbl., tech	lb.	.11 –	.12
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	7.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.50 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd	net ton	45.00 –	50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	7.00 –	7.50
No. 2 f.o.b. N.C.	long ton	4.50 –	5.00
No. 1 soap	long ton	7.00 –	....
No. 1 Canadian, f.o.b. mill, powd	long ton	20.00 –	....
Graphite, Ceylon, lump, first quality, bbl	lb.	.05½ –	.06
Ceylon, chip, bbl	lb.	.04½ –	.05
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.12 –	.12½
Gum tragacanth, sorts, bags	lb.	.48 –	.53
No. 1, bags	lb.	1.25 –	1.30
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, calcined, f.o.b. Cal.	ton	35.00 –	45.00
Pumice stone, imp., casks	lb.	.03 –	.40
Dom., lump, bbl	lb.	.06 –	.08
Dom., ground, bbl	lb.	.03 –	.05
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.25	3.50
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	....
Silica, glass sand, f.o.b. Ill.	ton	1.75 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.50 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	10.50 –	....
Talc, 200 mesh, f.o.b. Ga., bags	ton	8.00 –	12.00
Talc, 325 mesh, f.o.b. New York, grade A bags	ton	14.75 –	....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$4.00 –	$4.50
Corning	bbl.	2.15 –	....
Cabell	bbl.	2.20 –	....
Somerset	bbl.	2.30 –	2.50
Illinois	bbl.	2.07 –	....
Indiana	bbl.	2.08 –	....
Kansas and Okla. under 28 deg.	bbl.	1.00 –	....
California, 35 deg. and up	bbl.	1.40 –	....

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.20 –	....
Naphtha, V. M. & P. deod, steel bbls	gal	.19 –	....
Kerosene, ref. tank wagon	gal.	.15 –	....
Bulk, W.W. delivered, N.Y.	gal.	.08½ –	....
Lubricating oils:			
Cylinder, Penn., filtered	gal.	.32 –	.38
Bloomless, 30@31 grav.	gal.	.20 –	....
Paraffin, pale	gal.	.18 –	.18½
Spindle, 200, pale	gal.	.22 –	....
Petrolatum, amber, bbls	lb.	.04 –	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–$145
Chrome brick, f.o.b. Eastern shipping points	ton	45–47
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42–45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35–38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48–50
F.o.b. Mt. Union, Pa.	1,000	38–40
Silicon carbide refract. brick, 9-in.	1,000	1180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	$200.00 –	....

Ferrochromium, per lb. of Cr, 1-2% C	lb.	$0.30 –	....
4-6% C	lb.	.11½–	....
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	107.50 –	....
Spiegeleisen, 19-21% Mn	gr. ton	38.00 –	40.00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00 –	2.25
Ferrosilicon, 10-12%	gr. ton	41.50 –	46.50
50%	gr. ton	75.00 –	.....
Ferrotungsten, 70-80%, per lb. of W	lb.	.85 –	.95
Ferro-uranium, 35-50%, of U, per lb. of U	lb.	4.50 –	....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 –	4.00

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	....
C.i.f. Atlantic seaboard	ton	19.50 –	24.00
Coke, fdry., f.o.b. ovens	ton	4.75 –	5.25
Coke, furnace, f.o.b. ovens	ton	3.60 –	4.00
Fluorspar, gravel, f.o.b. mines, Illinois	ton	23.50 –	....
Ilmenite, 52% TiO_2 Va.	lb.	.01½–	....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.44 –	.46
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.80 –	....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –	....
Rutile, 95% TiO_2	lb.	.12 –	.15
Tungsten, scheelite, 60% WO_3 and over	unit	9.25 –	....
Tungsten, wolframite, 60% WO_3	unit	9.00 –	9.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 –	2.50
Vanadium pentoxide, 99%	lb.	2.00 –	14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	1.25
Zircon, 99%	lb.	.06 –	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.13½–.......
Aluminum, 98 to 99%	lb.	.27 – .28
Antimony, wholesale, Chinese and Japanese	lb.	.09½– .09¾
Nickel, 99%	lb.	.27 – .30
Monel metal, shot and blocks	lb.	.32
Tin, 5-ton lots, Straits	lb.	.48
Lead, New York, spot	lb.	.0795–.08
Lead, E. St. Louis, spot	lb.	.07625–......
Zinc, spot, New York	lb.	.0615
Zinc, spot, E. St. Louis	lb.	.0580
Silver (commercial)	oz.	.64⅝
Cadmium	lb.	.60
Bismuth (500 lb. lots)	lb.	2.35
Cobalt	lb.	2.40-2.45
Magnesium, ingots, 99%	lb.	.90-.95
Platinum, refined	oz.	115.00
Iridium	oz.	275.00-300.00
Palladium	oz.	83.00
Mercury	75 lb.	77.00-79.00
Tungsten powder	lb.	.95-1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	19.75
Copper bottoms	29.75
Copper rods	20.25
High brass wire	18.25
High brass rods	15.50
Low brass wire	20.00
Low brass rods	20.50
Brazed brass tubing	24.50
Brazed bronze tubing	25.75
Seamless copper tubing	22.75
Seamless high brass tubing	21.50

OLD METALS—The following are the dealers purchasing prices in cents per pound

Copper, heavy and crucible	11.00 @ 11.50
Copper, heavy and wire	10.75 @ 11.00
Copper, light and bottoms	9.00 @ 9.25
Lead, heavy	5.75 @ 6.00
Lead, tea	3.75 @ 4.00
Brass, heavy	6.00 @ 6.25
Brass, light	5.00 @ 5.25
No. 1 yellow brass turnings	7.00 @ 7.25
Zinc scrap	3.75 @ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3.64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

BIRMINGHAM—The Standard Gas Products Co. has purchased property on 28th Ave., near 18th St., and will have plans prepared for the erection of a new plant, estimated to cost approximately $135,000, including equipment.

California

MARTINEZ—The Alunite Potash Co. of America has acquired a tract of about 7 acres of land, fronting on the line of the Sante Fe Railroad, and plans for the erection of a new plant for the production of commercial potash. The initial unit will have a capacity of approximately 25 tons per day, to be increased at a later date with additional units to about 100 tons daily. It will cost $40,000.

LOS ANGELES—The Beaver Glass Mfg. Co., recently organized with a capital of $1,000,000, is planning for the establishment of a local plant for the manufacture of glass jars, patented jar caps and kindred products, and will begin work at an early date. The company is headed by Elmer Beavers, one of the heads of the Beaver Seal Jar Cap Co., Norristown, Pa.

SAN JOSE—The Kartschoke Clay Products Co., operating a local brick-manufacturing plant, is planning for extensions for the manufacture of hollow tile, vitrified sewer pipe, drain tile and kindred burned clay products, and purposes to commence the installation of equipment at an early date. G. Kartschoke is president; and P. E. Mehan, plant superintendent.

Connecticut

WATERBURY—The American Crystal Co. has awarded a general building contract to the Torrington Building Co., Torrington, Conn., for the erection of its proposed 1-story plant on South Main St., to be 90x185 ft., estimated to cost about $25,000, with equipment.

MANCHESTER—The South Manchester Water Co. has taken out a permit to install a new filtration plant at its waterworks on Line St., estimated to cost $43,000.

Florida

OLDSMAR—In connection with the establishment of a new local plant for the manufacture of brass castings, the Lovelace Engineering & Mfg. Co. is planning for the establishment of departments for enameling, galvanizing and nickel-plating. A new foundry addition will be erected in connection with existing buildings, with the installation of electric-operated equipment. T. T. Lovelace is president.

Georgia

MCINTYRE—The Akron Pigment Co. has tentative plans under advisement for the rebuilding of the portion of its local plant, recently destroyed by fire with loss of about $75,000, including equipment.

Idaho

LEWISTON—The Panhandle Asbestos Co. has tentative plans under advisement for the construction of a local mill for the production of asbestos products. The local Chamber of Commerce is reported as interested in the project.

Illinois

CHICAGO—The Illinois Glass Co., 2600 North Crawford Ave., manufacturer of hollowware, has awarded a general contract to W. F. Peterson, 300 North Central Ave., for the erection of a 1-story and basement addition at North Crawford and Wrightwood Sts., estimated to cost $80,000. H. H. Green, 306 South Wabash Ave., is architect and engineer.

Indiana

INDIANAPOLIS—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron sanitary ware, is completing plans for the erection of a local factory branch and distributing works, 3-story, 80x150 ft., at Pratt and Senate Sts., estimated to cost $180,000, with equipment.

Maryland

HAGERSTOWN—The Harloe Tire Co., Inc., Winchester, Va., has acquired a local site and plans for the erection of a new plant for the manufacture of solid rubber tires for motor truck and other service. It is estimated to cost in excess of $65,000. The present works at Winchester will be removed to the new location and the capacity increased. Employment will be given to about 150 operatives.

Massachusetts

LOWELL—The Wamesit Chemical Co., manufacturer of lactic acid and affiliated products, has tentative plans under advisement for the rebuilding of the portion of its plant at Tewksbury destroyed by fire, April 22, with loss approximating $200,000, including equipment.

EVERETT—The Massachusetts Gas Co., 111 Devonshire St., Boston, Mass., has arranged for a note issue of $5,000,000, the proceeds to be used for the construction of a blast furnace on site selected at Everett, to be operated by a subsidiary organization.

Michigan

DETROIT—The Howe-Martz Glass Co., 930 Monroe St., near Hastings St., has commenced the erection of a 1-story addition to its plant for considerable increase in output.

DETROIT—The Ford Motor Co., Highland Park, is completing plans and will soon take bids for the erection of a 1-story unit at its proposed River Rouge steel works, to be 120x320 ft., to cost in excess of $400,000, with equipment. It will be used primarily for soaking pit service. Albert Kahn, 1000 Marquette Bldg., is architect.

DETROIT—The F. L. & J. C. Codman Co., 745 Beaubien St., manufacturer of abrasive wheels and materials, will break ground for a new 1-story plant on Klinger St., near Davison St., 75x100 ft., to cost approximately $25,000.

Missouri

SEDALIA—The American Disinfecting Co., C. D. Van Dyne, head, is completing plans and will take bids early in May for the erection of a 2-story and basement plan, 80x100 ft., for the manufacture of disinfectants and kindred chemical products, estimated to cost $25,000. C. H. Johnson, City National Bank Bldg., is architect.

ST. JOSEPH—In connection with extensions and improvements in its waterworks, estimated to cost $600,000, the St. Joseph Water Co., Francis and 8th Sts., plans for the installation of a new filtration building, coagulating and sterilization equipment. Charles H. Taylor is president.

EMINENCE—The Shawnee Copper Co., recently organized with a capital of $50,000, plans for the installation of a mining plant on tract of about 75 acres of land, lately acquired, including drilling, hoisting conveying and other equipment. R. E. Carr is secretary; and W. A. Despain, treasurer.

New Jersey

TRENTON—The Thomas Maddock's Sons Co., Ewing and Perry Sts., manufacturer of sanitary earthenware products, has awarded a general contract to the Charles J. Smith Construction Co., 202 Acadamy St., for the erection of its proposed pottery at Hutchinson's Mills, Hamilton Township, near Trenton, to consist of a group of seven communicating buildings, each 1-story, totaling about 335,000 sq.ft. of floor area, with power house. It is expected to require about 6 months to complete. The estimated cost is placed at $750,000, with equipmen.t The present plant will be continued in service, and at a later date may be removed to the new location. Archibald M. Maddock is president.

NORTH BERGEN — The Rohrback Plate Glass Co., 236 Paterson Turnpike, has tentative plans for the rebuilding of the portion of its plant destroyed by fire, April 16, with loss estimated at $17,000.

TRENTON—The Eagle Electric Porcelain Co., Chadwick St., has taken out a permit to construct a 1-story addition to its plant to cost approximately $10,000, on which work will begin at once.

New York

TROY—The Troy Coke & Iron Co., Inc., recently organized by officials of the Burden Iron Co., with local plant, is perfecting plans for the erection of a new steel works, consisting of a number of 1-story units, with power house, estimated to cost in excess of $1,300,000, with equipment. A byproducts coke plant will also be established. It is expected to commence work in June.

North Carolina

KINSTON—The Kinston Gas Co. has acquired the municipal gas plant and has preliminary plans under advisement for extensions and betterments to cost about $100,000, with equipment.

Ohio

SEBRING—The Sebring Pottery Co., manufacturer of general ware, has plans under way for the erection of an addition, 100x500 ft., estimated to cost $100,000. It is understood that a new tunnel kiln will be installed. O. H. Sebring is head.

DAYTON—The O'Brien Printing Ink Co. is considering plans for the erection of a new plant on Warren St., near Vine St., to cost in excess of $50,000, for which it is expected to ask bids in the near future. D. G. O'Brien is president.

Oklahoma

ALTUS—The Baker Cotton Oil Co. has work under way on a new local plant consisting of a number of buildings with power house, estimated to cost $22,000. William Baker is president.

Pennsylvania

HARRISBURG — The Air Reduction Sales Corp., 342 Madison Ave., New York, manufacturer of industrial oxygen, acetylene welding apparatus, etc., has awarded a general contract to the Central Construction Co., Emerald and 7th Sts., Harrisburg, for the erection of the initial unit of its proposed local plant, 1-story, estimated to cost $75,000. Work will commence at once. Francisco & Jacobus, 511 5th Ave., New York, are architects.

PHILADELPHIA—The Endura Mfg. Co., Eastwick and 63rd Sts., manufacturer of oilproof and other special papers, has preliminary plans under advisement for the rebuilding of the portion of its plant destroyed by fire, April 20, with loss estimated at $100,000, including equipment.

DURANT CITY—W. A. James, Kane, Pa., and associates are organizing a company to construct and operate a local glass-manufacturing plant for the production of plate glass materials. It will consist of a number of units with power house, estimated to cost $1,200,000, with machinery.

LEWISTOWN — The Pennsylvania Wire Glass Co., Pennsylvania Bldg., has revised plans nearing completion for the erection of the first unit of its proposed local plant, to be 1-story, 180x750 ft., estimated to cost $450,000, including equipment. F. A. Hayes is company architect. Walter Cox is president.

MORRISVILLE—The Vulcanized Rubber Co. has commenced the erection of a 1-story addition to its plant, 40x134 ft., to be equipped as a dust press department, estimated to cost $50,000. The company is also considering other additions. Headquarters are at 251 4th Ave., New York.

Tennessee

CHATTANOOGA — The local plant of the Dubois Rubber & Tire Co. has been acquired by G. H. Kaiser, Knoxville, Tenn., and associates. The new owners will organize a company to operate the mill and have preliminary plans under way for extensions and improvements. The plant will specialize in the manufacture of automobile tires and tubes.

Texas

AMARILLO—The Reece S. Allen Oil Co. is reported to be planning for enlargements in its local refinery for considerable increase in output.

HOUSTON—The Houston Gas & Fuel Co. has preliminary plans for a fund of about $2,000,000, to be used for extensions and improvements in its artificial gas works during the next 36 months, including generating apparatus, gas holders and other expansion.

COLORADO — The Anderson-Prichard Oil Corp., Oklahoma City, Okla., has superstructure work in progress on its proposed local refinery, and plans to begin the equipment installation at an early date.

EL PASO—Joseph T. Newburger, head of the Newburger Cotton Co., Memphis, Tenn., will hold a principal interest in a new company to be organized to construct and operate a fumigation plant and cotton compress works in the vicinity of El Paso, estimated to cost close to $250,000, including equipment. It is expected to begin work at an early date.

Virginia

BEDFORD—The Bedford Tire & Rubber Co. is perfecting plans for the erection of a new local plant, to be 2-story, 60x200 ft., estimated to cost $85,000, including equipment. A. K. Simmons, Roanoke, Va., is architect. L. R. Gills is president.

NORFOLK — The International Cement Corp., 342 Madison Ave., New York, is closing negotiations for the purchase of a tract of about 2,500 acres of local land, with existing cement mill, rated at 400,000 bbl. per annum, capacity. The new owner plans for immediate improvements and enlargements in the plant to develop an output of close to 1,000,000 bbl. per year. Considerable additional equipment will be installed. The company is disposing of a preferred stock issue of $2,000,000, a portion of the proceeds to be used for the expansion. Holger Struckmann is president.

BRISTOL—The Central Glass Co., Louisville, Ky., has selected a site at Bristol and will soon commence the erection of a new plant, to be operated in conjunction with the Louisville works. The cost is reported in excess of $75,000. C. W. Kendle is president.

Washington

VALLEY—The Northwest Magnesite Co. has acquired the local plant and properties of the American Mineral Products Co., for a consideration stated at $1,000,000. The purchasing company is planning for extensive operations and will develop the acquired plant for the production of magnesite. The present works of the Northwest company will also be continued in service. Roy N. Bishop is president.

SPOKANE—The American Fire Brick Co. has plans in progress for extensions and improvements in its local refractory plant to cost about $25,000, including equipment.

Industrial Notes

THE ANILINE COLOR & CHEMICAL CO., INC., 162 West Kinzie St., Chicago, Ill., announces that it has taken over the office and laboratory of the Associated Color & Chemical Co. at 590 Howard St., San Francisco. D. F. Driscoll, former branch manager of the Dyes Distributing Corporation and manager of the Associated Color & Chemical Co., has been retained as Pacific Coast manager. Full stocks of imported and domestic colors will be carried.

THE INTERNATIONAL OXYGEN CO., Newark, N. J., has added H. S. Tarbert to its sales force at Pittsburgh, Pa. Mr. Tarbert was formerly connected with the MacBeth Evans Glass Co., Pittsburgh. Newton D. Schulman is sales agent at Toledo, Ohio.

THE AMERICAN NICKELOID CO., Walnutport, Pa., has appointed James MacCrindle, of Peru, Ill., superintendent. The plant will start operations shortly.

THE TULSA OXO-HYDRO CO., Tulsa, Okla., manufacturer of oxygen, carbide and acetylene, has elected Willard Foster president.

THE AJAX RUBBER CO., of Trenton, N. J., has elected Edward L. Fries, secretary-treasurer, a vice-president of the company; F. M. Hoblitt, vice-president and general manager, has been elected a director, succeeding L. P. Destribats, resigned.

THE WILDMAN RUBBER CO., Bay City, Mich., has re-elected W. W. Wildman president.

THE BRITISH EMPIRE STEEL CORPORATION has appointed Arthur M. Irvine general sales manager of coal, succeeding the late Alexander Dick.

New Companies

SOUTHERN INSECTICIDE CO., Fort Valley, Ga.; insecticides, chemical compounds, etc.; $50,000. Incorporators: J. M. Jones and W. S. Connal, both of Fort Valley.

PACIFIC SOUTHWEST TANNERIES, INC., Los Angeles, Calif.; leather products; $50,000. Incorporators: A. G. McCoy, M. W. Miller and M. P. Smith. Representative: Frank R. and Byron D. Seaver, W. I. Hollingsworth Bldg., Los Angeles.

GRAFTON MICA PRODUCTS CO., INC., Boston, Mass.; mica specialties and kindred products; $50,000. David W. Moffatt is president; and Frank W. Hall, Grafton, N. H., treasurer and representative.

TRIX PRODUCTS CORP., New York, N. Y.; chemicals and chemical compounds; $10,000. Incorporators: F. Rothman and H. Gottesman. Representative: L. B. Brodsky, 200 Broadway, New York.

UNION SMELTING & REFINING CORP., Huntington Park, Calif.; metal smelting and refining; $300,000. Incorporators: H. L. Engel, G. L. Bennett, J. L. Kroegar and J. M. Dietz, all of Los Angeles.

FAINTON SILICA-KAOLIN CO., care of Martin E. Smith, 925 Market St., Wilmington, Del., representative; operate refining properties for the production of silica, kaolin and other clays; $250,000.

Imports at New York

(*Continued from page 730*)

QUICKSILVER — 300 flasks, Leghorn, Order; 500 flasks, Trieste, Order.

SAL AMMONIAC—169 csk., Hamburg, E. Suter & Co.; 89 bbl., Hamburg, Roessler & Hasslacher Chem. Co.

SHELLAC — 50 bg., Calcutta, Irving Bank; 50 bg. butter, Calcutta, J. Munroe & Co.; 250 bg., Calcutta, British Overseas Bank; 100 bg., Calcutta, New York Trust Co.; 303 bg., Calcutta, Standard Bank of South Africa; 22 bg., Calcutta, Lee, Higginson Co.; 142 bg., Calcutta, Marx & Rawolle; 100 bg., Calcutta, British Bank of South America; 1,550 bg., Calcutta, Order; 70 bg., Hamburg, Kasebier-Chatfield Shellac Co.; 200 bg., London, Order; 190 bg., London, Ralli Bros.; 100 bg. garnet, Calcutta, Brown Bros. & Co.; 100 bg., Calcutta, First Natl. Bank of Boston; 100 bg., Calcutta, Lee, Higginson & Co.; 525 bg., Calcutta, Order; 100 cs., Hamburg, Ralli Bros.

SODIUM SALTS—20 csk. fluoride, Hamburg, E. Suter & Co.; 4 csk. nitrite, Hamburg, Kuttroff, Pickhardt & Co.; 100 cs. superoxide, Hamburg, E. Suter & Co.; 420 cs. cyanide, Hamburg, Roessler & Hasslacher Chem. Co.; 19 csk. prussiate, Liverpool, Order; 2,510 cs. cyanide, Hamburg, Roessler & Hasslacher Chemical Co.; 100 csk. nitrite, Hamburg, E. Suter & Co.; 50 cs. cyanide, Liverpool, Order; 16,585 bg. nitrate, Iquique, W. R. Grace & Co.; 500 bg. silico fluoride, Copenhagen, Order; 50 cs. hydrosulphite, Hamburg, Kuttroff, Pickhardt & Co.

STARCH—1,000 bg., Rotterdam, Stein. Hall & Co.; 20 bg., Rotterdam, Globe Shipping Co.

SUMAC—700 bg., Palermo, New York Trust Co.; 1,610 bg. ground, Palermo, Order.

TALC—400 bg., Genoa, Bankers Trust Co.; 400 bg., Genoa, C. Mathieu.

TARTAR—34 csk., Naples, Tartar Chemical Works; 135 bg., Bordeaux, Kidder, Peabody & Co.; 22 csk., Hamburg, Order.

UMBER — 210 bg. burnt, Hull, H. A. Robinson & Co.; 16 csk., Hull, L. H. Butcher Co.; 365 bg. and 40 bbl., Leghorn, Reichard-Coulston, Inc.; 75 bbl., Leghorn, E. E. Marks & Co.; 86 bbl., Leghorn, Order.

WATTLE BARK — 6,456 bg., Durban, Tannin Corp.; 1,382 bg., Durban, Hammond & Carpenter Corp.; 1,177 bg., Durban, E. J. Haley, Inc.; 231 bg., Durban, W. L. Montgomery & Co.

WAXES—18 bg. beeswax, Alexandria, Order; 16 bg. do., Santiago, R. Desvernine; 14 bbl. do., San Juan, G. Preston; 71 csk. carnuba, Hamburg, Order; 34 bbl. beeswax, Rotterdam, Pond's Extract Co.; 35 bg. beeswax, Leghorn, Bank of America.

WHITING—1,200 bg., Hull, Hammill & Gillespie; 200 bg., Hull, J. Lee Smith & Co.

WOOL GREASE—78 cs., London, Order.

ZINC OXIDE — 116 csk., Hamburg, Philipp Bros.

ZINC SULPHIDE — 11 bbl., Hamburg, Order.